NIAGARA PENINSULA

STANDARD CONTRACT DOCUMENT

SPECIAL PROVISIONS

CONTRACT ITEMS

SPECIAL PROVISIONS - CONTRACT ITEMS

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A1 - Bonding

Payment at the lump-sum price for this item shall be full compensation for the provision of bonding as specified in the Special Provision and General Condition of this contract.

Full payment will be made under this item in the first progress payment subject to the bonds being acceptable to the Owner.

A2 - Preconstruction Survey

The Contractor will be required to arrange for a pre-construction survey of all abutting properties on both sides of the street affected by the excavations and any other properties/structures that may be subject to possible damage as a result of heavy construction operations. This will be performed by an inspection company experienced in this work and approved by the Owner. The Contractor will be required to indemnify the Owner against any claim by abutting property owners for damages sustained due to any construction activities.

The Contractor shall ensure that advance notice is given to the residents, advising them of a pre-construction survey. A copy of the preconstruction survey shall be filed with the Owner prior to commencement of construction.

Full payment will be made under this item in the first progress payment provided that a satisfactory preconstruction survey is filed with the Owner.

A3 - Site Office

The Contractor shall provide for the Engineer's sole use, an insulated, heated and cooled (if necessary) field office with windows, a lockable door and a minimum floor area of 12 square metres in size, with a stool, a desk and chair, a telephone, and shall be lit by electricity.

3.1 Basis of Payment

Payment at the lump-sum price bid for this item shall be full compensation for the supply, erection, equipping, servicing and maintenance of the field office and shall include such costs as sanitary facilities, hydro, heating, and telephone servicing, with the exception of long-distance calls placed by Contract Administrator.

For progress payment, fifty (50) percent of the lump sum price will be paid upon satisfactory installation. The balance will be paid upon satisfactory removal and clean-up of site area.

A4 - Construction Layout

(Note: When this item is included as a tender item, this special provision supersedes Special Provision G14).

The provisions of GC7.02 apply except as amended or extended herein.

Where the contractor is permitted to use the owner's CAD drawings to perform construction layout, the contractor shall verify that the control points have numerical elevations, northings and eastings that are correct and match those shown on the CAD drawings, prior to commencement of construction.

All layout performed by the contractor's layout surveyor shall be tied to the control points provided by the designer and verified by the layout surveyor.

Any errors occurring as a result of unverified control points will be rectified by the contractor at no cost to the owner.

All survey stakes shall be removed at the end of construction by the Contractor.

4.1 Basis of Payment

The lump sum price bid shall be full compensation for the provision of all labour, material and equipment necessary to carry out the layout.

For progress payment, fifty (50) percent of the lump sum price will be paid upon the undertaking of the initial layout. The balance will be prorated over the remainder of the working period.

A5 - Clearing and Grubbing

The provisions of OPSS 201 apply except as amended or extended herein.

The Contractor shall limit his work area to the right-of-way. The use of private driveways or lawn area where deemed essential is the responsibility of the Contractor. Prior approval from the property owner shall be obtained by the Contractor in writing and any damage resulting from such use is the sole responsibility of the Contractor.

To avoid danger to traffic, buildings, people and property, the Contractor shall cut the trees in sections from the top down.

The abutting property owner shall have first claim to any salvaged timber for firewood. All remaining material becomes the property of the Contractor who shall be responsible for disposal off site. The sale of salvaged timber on site is prohibited. Burning on-site will not be permitted.
Measurement for payment shall be as per OPSS 201.09.01.01.02.

A6 - Tree Relocation

Payment shall be based on the "All Inclusive Price Method" for the transplanting of specified trees, by spade method, to locations as staked in the field.

The work shall be carried out by specialist firms engaged in the type of work specified and using workmen skilled in the various aspects of tree transplanting by spade method.
The spading operation shall be carried out by means of a 2250 mm spade or larger and in accordance with proper arboricultural practices.
The Contractor shall if necessary prune the tree to aid in the transplanting operation. The natural shape or habit of the tree shall not be changed. Pruning shall be carried out in accordance with good arboricultural practices.

The transplanted tree shall be backfilled with topsoil to fill all voids between the planting pit and rootball. When the planting pit has been backfilled to ground level, the surrounding ground will be fine graded so as to present the tree as in its natural growth and original habit.

The transplanting operation shall be undertaken such that the transplanting of any tree is carried out on the same day, unless otherwise directed by the Contract Administrator.

A7 - Install, Maintain and Remove Silt Control Devices

The provisions of OPSS 805 apply except as amended or extended herein.

7.1 Rock Check Dam

(a) Location

The Contractor shall install check dams where existing ditches outlet into major creek crossings and where directed by the Contract Administrator.

(b) Maintenance

The check dam shall be inspected after each significant rainfall. Necessary repairs shall be made promptly and sediment shall be removed when it reaches one half the dam height or sooner. Silt removal must be undertaken

with care to minimize downstream sedimentation in the swale or ditch.

(c) Removal of Check Dam

The check dam and sediments shall be removed at the direction of the Contract Administrator and disposed of outside the right-of-way in accordance with OPSS 510.

This will normally be required once permanent ground cover is established. The site shall be graded to conform to surrounding contours without damaging adjacent ground cover.

(d) Payment

Payment shall be made for each check dam constructed, maintained and removed.

For progress payment, fifty (50) percent of the unit price will be paid upon installation. The balance will be paid upon removal.

7.2 Construct Temporary Silt Fence

Supply and construct 1.2 m high silt fence complete with 50 x 50 mm timber posts or metal T-Bars at 1.2 m c/c and cut off trench, where indicated on the contract drawings. The silt fence material shall be a woven geotextile and shall be attached securely with wire or staples. Install before any construction work commences. Sediment must be removed from silt fence when accumulation reaches 50% of the height of the fence. The silt fence must be inspected immediately after each rainfall event. Dismantle and remove after restoration of the site is complete and/or when entire site is stabilized as directed by the Contract Administrator.

Payment at the lump sum price bid shall be full compensation for the provision of all labour, equipment and material necessary to install, maintain during construction and remove the temporary silt fence.

For progress payment, fifty (50) percent of the lump sum price will be paid upon installation. The balance will be paid upon removal.

A8 - Construction Signs, Traffic Control, and Traffic Management Plan

The provisions of GC7.06 and OPSS 706 apply except as amended or extended herein. The contractor shall be responsible for the preparation of a traffic management and control plan as per the Ministry of Labour's requirement.

Payment at the lump sum price bid for this item shall be full compensation for all labour, equipment and materials necessary to meet the specified requirements. Fifty (50) percent of the lump sum price will be paid upon initial supply of the construction signs. The balance will be pro-rated over the remainder of the working period.

The traffic management plan shall address both vehicular and pedestrian traffic. During construction which conflicts with existing sidewalks special consideration shall be given to the safety of pedestrian traffic. This shall include but not be limited to signs/directions to alternate routes around construction zones and locations of pedestrian and school crossings. Such alternate routes shall be maintained at all times to ensure unobstructed and safe movement of pedestrian traffic.

After working hours and on weekends or holidays all disturbed sidewalk sections shall either be reinstated to provide a stable hard surface for pedestrians and wheelchairs.

A9 - Contingency Allowance

When a lump sum amount for Contingency Allowance is shown in the Schedule of Tender Unit Prices bidders are requested to include this lump sum amount in their tender price.

The amount of Contingency Allowance is provided solely for the purpose of covering only the cost of extra work that may be needed during construction and as authorized by the Contract Administrator using the approved Change Order Forms.

Final payment to the Contractor will exclude all or the balance of the Contingency Allowance amount which has not been utilized for the purpose of extra work.

B1 - Test Pits

The unit price for this item shall include sawcutting, excavation and removal of all materials to a maximum depth specified in the Form of Tender and backfilling with granular materials and 50 mm of hot or cold mix. Reinstatements shall be completed at the end of each day.

The quantity of test pits to be paid for will be the number of test pits based on field measurements. Granular bedding, cover and backfill will be paid for under the granular items. Hot or cold mix will be paid for under the appropriate items.

Payment shall be full compensation for all labour, equipment and materials required to do the work.

B2 - Earth Excavation

The provisions of OPSS 206 and Special Provisions - General, G11 shall apply except as amended or extended herein.

Work under this item includes excavating, filling and grading of all materials including road beds, ditches and widenings in accordance with the design cross-sections and profile. For urban cross-sections, the limits of the excavation shall be 300 mm behind the back of the curb, unless specified otherwise on the contract drawings and/or cross-sections.

The owner shall specify if excavation quantities are to include the volume of asphalt removed or if asphalt will be paid separately.

The unit price shall also allow for sawcutting existing asphalt, road surfaces and asphalt and concrete driveways in a straight line to ensure a neat and straight joint. Sawcutting operations shall be carried out immediately preceding asphalt paving to ensure proper jointing.

During excavation, the Contractor shall take due precautions to protect existing manhole frames and covers, manholes, valve chambers, valve boxes, curb stops within the right-of-ways. Any of the aforesaid appurtenances, if damaged directly or indirectly by the Contractor's operation shall be replaced by the Contractor. The unit price bid shall be deemed to have made due allowance for this contingency.

Excavations not shown on the contract drawings or excavation below subgrade to any depth, as authorized by the Contract Administrator, shall be measured on site and paid for under this item.

Earth excavation for subdrain installation and swale construction will not be paid for under this item, and shall be included in their respective items.

Earth excavation for sidewalks where the grade difference between the existing ground elevation and new sidewalk elevation is greater than 75mm shall be included in this item.

Topsoil gained from stripping may be stockpiled and used in the sodding operation.

Measurement for payment under this item will be as of OPSS 206.09.01.01.

B3 - Granular Material

Work under this item shall include the supply and placing of granular material in roadways, driveways, sidewalk base and for bedding, cover and backfill for storm and sanitary sewers, watermains, forcemains, and associated appurtenance and culverts.

Placement of the granular is to be as per the Construction and Details Drawings and in accordance with OPSS 314, 401 and 402.

For shoulder construction, the Contractor shall supply only Granular "M" limestone aggregate. Calcium chloride flake shall be applied at the rate of 0.25 kg/m^2 if specified by the Contract Administrator. Payment for the calcium chloride flake will be included under the item for that material.

Before paving will be permitted, the finished granular elevations must be checked and approved by the Contract Administrator.

Measurement for payment shall be as per OPSS 314.09.01.01.01.

B4 - Reprocessing and Compacting of Existing Pavement

The provisions of OPSS 330 shall apply unless otherwise amended or extended herein.

The equipment shall consist of either a Bomag pulvi-mixer or any equivalent reprocessing equipment. The equipment to be used must be approved by the Contract Administrator prior to commencement of the project. Bidders shall indicate the type of equipment to be used in Statement 'D' of the Form of Tender.

The entire width of the existing pavement structure shall be reprocessed. The Contractor shall ensure that the existing pavement and the granular base course are thoroughly mixed to a minimum depth of 200 mm unless otherwise specified less by the Contract Administrator. The processing shall be carried out such that 95% of the mix material passes the 26.5 mm sieve and not more than 75% passes the 4.75 mm sieve.

The contractor shall be responsible for establishing all lines, elevations, and grades for the pavement reprocessing.

Measurement for payment shall be as per OPSS 330.09.01.01.

B5 - On-Site Recycling of Asphalt and Granular Material

For the unit price bid, the Contractor shall pulverize the existing asphalt, thoroughly mix with the underlying granular materials and utilize same as granular backfill or road base (OPSS 1010). The use of this mixed material shall be continuously monitored by the Contract Administrator and the final volume recycled will depend on its acceptability (including gradation and deleterious inclusions).

All requirements for depth of layers and compaction shall be as per the item for Granular "A". The amount tendered will be dependent upon the continuous acceptability of the material and should this material subsequently be rejected, a similar increase in imported granular material shall be required.

The use of recycled material and the amount utilized may affect the final quantities of the Granular "A" item. If so, no claim shall be considered for variations to final quantities as per G.C. 8.01.02.

Measurement for payment shall be per tonne as calculated by average end areas and tonnage conversion as determined by material testing.

B6 - Subdrain

(Note: The size and type of subdrain should be included in the Schedule of Tender Unit Prices).

The provisions of OPSS 405 apply except as amended on extended herein.

The unit price shall include excavation, regardless of the depth. Granular bedding, cover and backfill will be paid for under the granular items.

The subdrain shall be perforated high density polyethylene pipe with filter wrap.

Measurement for payment shall be as per OPSS 405.09.01.01.

B7 - Installation of New Culvert

(Note: The size and minimum thickness of the new culvert should be included in the Schedule of Tender Unit Prices).

The provisions of OPSS 421 apply except as amended or extended herein.
The unit price shall include all labour, material, and equipment required for the culvert installation including saw-cutting of the asphalt pavement and minor ditching at each end of culvert. Bed and cover in accordance with OPSD 802.010 for flexible pipe and OPSD 802.030 for rigid pipe. Pipe culvert frost treatment in accordance with OPSD 803.030 and 803.031.

Bedding, cover and backfill for the culvert shall be Granular "A" and shall be included in the unit price unless a separate Granular item is identified in the Schedule of Tender Unit Prices.

The minimum thickness shall be **AS SPECIFIED IN THE SCHEDULE OF TENDER UNIT PRICES**.

Measurement for payment shall be as per OPSS 421.09.01.01.

B8 - Concrete - Curb and Gutter

The provisions of OPSS 353 apply except as amended or extended herein.

The unit price bid shall include the construction of all types of concrete curbs and gutters, including drop sections at driveways and sidewalk ramps and curb and gutter terminations.

The unit price shall also include the recessed catch basin detail where specified on the contract drawings.

Measurement for payment shall be as per OPSS 353.09.01.01.

B9 - Concrete Sidewalks

(Note: Concrete sidewalks of varying depths and/or those including reinforcing steel should be identified separately in the Schedule of Tender Unit Prices.)

The provisions of OPSS 351 apply except as amended or extended herein.

The unit price bid shall include the following:

- Construction of concrete sidewalk as per OPSD 310.010 to 310.050 inclusive;

- All excavation and fill required for the sidewalk at the sidewalk ramps and where the grade difference between the existing ground elevation and new sidewalk elevation is less than 75 mm;

Contraction joints shall be sawcut, 5mm wide and should be cut at a minimum depth of one quarter of the sidewalk thickness.

Expansion joints shall be placed every 30m centre to centre maximum. Expansion joints shall be constructed to the full depth and width of the slab.

Contraction joints shall be spaced at 2.5 centre to centre maximum.

All joints are to be perpendicular to the line of the sidewalk.

Measurement for payment shall be as per OPSS 351.09.01.01.

Payment at the unit price bid shall be as per OPSS 351.10.01 and shall include excavation and fill as outlined above. Payment for Granular 'A' shall be included under the appropriate granular item in the Schedule of Tender Unit Prices. Where no separate items are identified in the Schedule of Tender Unit Prices, the unit price for sidewalk construction shall include excavation and/or fill and the supply and placing of Granular 'A'.

B10 - Sawcutting Pavement

(Note: This specification is intended to cover the sawcutting operation for all purposes, when a sawcutting item is included in the contract documents. Sawcutting for other instances is covered under Special Provision G13)

The unit price bid shall include all labour, equipment and materials necessary to sawcut the pavement for base repair areas.

- Concrete saw is to be equipped with own water supply to control nuisance dust

Payment shall be made at the unit price bid per metre as measured in the field by the Contract Administrator.

B11 - Asphalt Milling

The unit price bid for this item shall include all equipment and labour necessary to complete the asphalt milling as specified, in such a manner so that the pavement is not torn, broken, oil-coated or otherwise injured by the milling operation and is at an even grade when completed. Unless specified in the contract for reuse or disposal to a designated location, the material once milled comes under the ownership of the Contractor and the unit price bid shall also include the disposal of asphalt and aggregate cuttings from the limits of the job site. Sweeping by means of a mechanical vac-sweep during the operation shall be deemed to also be included in the unit price bid for this item.

Where catch basins cannot be adjusted vertically due to grade or curb construction, the Contractor shall remove the existing asphalt to a depth of 50 mm in the immediate vicinity of the catch basin for a distance of 2 m from the catch basin. The asphalt so removed shall be disposed off the site.

In accordance with OPSS 510.07.06.04, mill a 3.6 metre wide strip, unless indicated otherwise on the Contract Drawings, tapered from 0 mm to the scheduled depth of surface coarse at all contract limits unless otherwise specified. At all side streets, mill as directed to provide a flush transverse joint to a maximum of 40 mm deep. Mill a 1.8 metre wide strip unless otherwise directed along the curb tapered from 0 mm to 50 mm.

Ramp all milled edges on the through streets. Ramp all manholes, catch basins and valve boxes and remove ramping prior to paving.

Heater planing will not be allowed under this contract.

The milling operation shall not precede the paving operation by more than 10 days.

After the milling operation is complete, the Contractor will be required to patch depressions in the milled areas within 24 hours and payment will be made under the appropriate asphalt tender item. The municipality will pay for the initial patching operation, but the costs associated with subsequent patching until the street is resurfaced, will be the responsibility of the Contractor. Failure to maintain the roadway will necessitate the work being done by the Owners and the costs deducted from the contract.

Measurement for payment for this item shall be the area in square metres milled as measured in the field.

B12 - Supply and Application of Tack Coat

The provisions of OPSS 310 and 1103 and special provisions B12 shall apply except as amended or extended herein.

With the exception of trench restoration areas and milled lap joints equal to or less than 300mm, that can be properly coated with a spray wand, tack coat shall be applied by using a self-propelled computer controlled asphalt distributor capable of applying tack coat in widths ranging from 0.3m to 3.7m. The control system shall show application rate of emulsion in l/m^2 along with total emulsion applied in litres (within 5 litres), as well as the total area covered (m^2) within 10 m^2 .

Tack coat shall be applied to all surfaces (vertical faces and horizontal plane) at the following application rates:

0.35 kg/ m^2 to all existing pavement surfaces and milled surfaces

0.20 kg/ m^2 new surfaces (between layers)

Faces at which joints are made shall be painted/sprayed with a thin uniform and continuous coating to the satisfaction of the Contract Administrator. The joint between pavement lanes, if paved in echelon is not required to be painted. Measurement for payment will be as per OPSS 310.09.01.02

B13 - Adjustment of Appurtenances

The provisions of OPSS 408 apply except as amended or extended herein.

The scheduling for adjustment of all appurtenances shall be governed by the proposed strategy planned for each roadway. On roads proposed for one lift of asphalt, all appurtenances shall be scheduled so that they do not precede the paving operations by more than one week.

On roads scheduled for a levelling coarse of asphalt, no adjustment of appurtenances shall be undertaken until after the placing of the levelling course. On roads scheduled for two courses of asphalt, no adjustment of appurtenances shall be undertaken until after the placing of the base (HL8) course.

The finished adjusted elevation of all appurtenances shall not vary more than 5 mm from the finished surface coarse elevation. Any readjustment after the final paving to within the allowable tolerance shall be at the Contractor's expense.

Compaction of materials around adjusted appurtenances shall be by means of a mechanical tamper. All edges and exposed concrete shall be tack coated (SS-1 Emulsion - OPSS 1103) prior to the placement of the HL8 to match existing asphalt.

All costs associated in the breaking out of concrete in the road base to adjust and/or replace appurtenances shall be deemed to have been included in the unit prices bid under this item

The supply, placement and compaction of Granular "A" to a density to 100 percent of the maximum dry density as backfill and 75 mm of HL8 to match the elevation of the existing asphalt shall be included under the items included in the Schedule of Tender Unit Prices. Where no separate items are identified in the Schedule of Tender Unit Prices, the unit price for the adjustments shall include the supply and placing of Granular “A” and HL8 asphalt necessary to complete the item. The price bid shall be for each adjustment type as listed in the form of tender.

(a) Existing Catch Basin Frame and Grate

Measurement for payment will be based on adjustment limits, i.e. i) up to 300mm and ii) 300 to 450 mm.

For the unit price bid under each adjustment item, the Contractor shall adjust the existing catch basins frame and grate to meet the proposed pavement elevation, including breaking out of curb and gutter where necessary. All adjustments shall be done by extending the existing walls upwards in concrete or by precast concrete adjustment units (OPSD-704.010) or by high density polyethylene adjustment units (OPSD-704.011), in the same horizontal dimensions as the top of the existing structure to the proposed elevation of the seat of the top and frame. The top and frame shall be reset and grouted. Metal adjusting rings will not be permitted.

The unit price bid shall include the necessary excavation and the supply and installation of the adjustment units and mortar or concrete.

(b) Replace Catch Basin Frame and Grate

For the unit price bid under this item, the Contractor shall remove the old castings and supply and install new cast iron frame and flat square grates (OPSD - 400.02 or 400.10) to meet the proposed pavement elevation.

Payment for adjusting shall be paid under the appropriate adjustment item.

The castings are to become the property of the Contractor and shall be removed off the site at the Contractor's expense.

(c) Valve Chamber, Manhole Frame and Cover

Measurement for payment will be based on adjustment limits, i.e. i) up to 300mm and ii) 300 to 450 mm.
For the unit price bid, under each adjustment the Contractor shall adjust vertically frame and cover of these appurtenances to accommodate the thickness of the asphalt overlay. All adjustments shall be done by extending the existing wall upwards in concrete or by precast concrete adjustment units (OPSD-704.010) or by (OPSD-704.011) in the same horizontal dimensions as the top of the existing structure to the proposed elevation of the seat of the frame and cover. The frame and cover shall be reset and grouted. Adjusting rings may be permitted subject to approval by the Contract Administrator. Temporary ramping will be paid for under the appropriate item. The Contractor is responsible for locating and uncovering any appurtenance covers that have been paved over under this contract.

In the case of Utility manholes, no adjustment will be permitted unless written authorization from the Contract Administrator has been reviewed by the Contractor.

(d) Replace Manhole Frame and Cover

For the unit price bid under this item, the Contractor shall remove the old and worn castings and install new cast iron frame and covers (OPSD 401.01) to meet the proposed pavement elevation.

Payment for adjusting shall be paid under the appropriate adjustment item.

The old castings are to become the property of the Contractor and shall be removed off the site at the Contractor's expense.

(e) Valve and Curb Boxes

The unit price bid for this item shall include compensation in full for all costs incurred in the adjustment of valve or curb boxes to meet the proposed road or boulevard elevation for those boxes which may be adjusted by means of raising the existing boxes. Adjusting rings may not be used, unless so instructed by the Engineer.

(f) Supply and Replace Valve and Curb Boxes

The unit price for this item shall include compensation in full for the supply and replacement of any valve or curb box which cannot be adjusted under Item 8(e).

The Contractor shall be responsible for notifying the appropriate Municipal Waterworks Department prior to replacing the valve of curb boxes. The unit price bid shall allow for the supply of new valve or curb boxes and making the final adjustment to the valve boxes to meet the proposed pavement or boulevard elevation.

(g) Rebuild Manhole

The unit price shall include all labour, materials and equipment to set the frame and cover to final grade as generally specified in OPSS 408 and as detailed in OPSS 408.07.09.

(h) Supply and Place Poured Concrete Manhole Adjustment

The unit price bid shall include all labour, materials and equipment to set the frame and cover to final grade including but not limited to:

Coring a minimum diameter of 1.2m to the appropriate depth and/or extend through the existing pavement structure to the granular base.

The removal and disposal of the existing adjustment and road structure material including clearing of all material down to the existing structure.

Salvage or reuse of the existing frame and cover. Where a new frame and cover are required to complete the adjustment it shall be in accordance with Section B13 (d).

Reset existing (or new) frame and cover to finished grade with a continuous pour of 32MPa concrete (high-early strength mix, with air entrainment) poured in place from the top of the existing structure to the underside of the frame or to finished road grade as required. The concrete at road surface shall be a heavy broom finish to ensure traction. In placement of concrete a mechanical vibratory method must be used.
Internal formwork can be either cardboard (Sono Tube) or PVC. If cardboard is used the form work must be stripped and all debris must be removed and disposed of off-site (PVC formwork can be left in place).

B14 - Supply & Place Hot Mix Asphalt

14.01 General

This specification covers hot mix asphalt to be used for the construction of roads, laneways, parking lots, and bikepaths and includes provisions for Quality Control (QC) and Quality Assurance (QA) testing. Unless otherwise amended herein, materials, production, and placement of hot mix asphalt shall conform to Ontario Provincial Standard Specifications (OPSS). For the purposes of this specification, “Owner” means the Municipality, which is the party to the contract for whom the work is being performed.

14.02 References

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

Ontario Provincial Standard Specifications, Material

OPSS 1003 Material Specification for Aggregates - Hot Mix Asphalt
OPSS 1150 Material Specification for Hot Mix Asphalt

Ontario Provincial Standard Specifications, Construction

OPSS 310 Construction Specification for Hot Mix Asphalt

Ministry of Transportation (MTO) Laboratory Testing Manual, Relevant Bituminous and Aggregate Test Standards, with Revisions

MTO Mix Design Method for Recycled Asphalt
MTO Designated Sources of Materials (DSM) List

14.03 Mix Classifications

Table 1 of OPSS 1150 is amended. The classes of hot mix asphalt, and the aggregate requirements of the mixes specified for the various construction applications, are outlined in Table 1 of this specification.

14.03.1 Specialty Mix

Stone Mastic Asphalt (SMA) is a specialty mix with superior rut resistant properties for use where there is high volume heavy commercial truck traffic, or high volume bus traffic. SMA specifications for materials and construction included separately herein.

TABLE 1
SUMMARY OF ASPHALT MIX TYPES AND AGGREGATE REQUIREMENTS

Hot Mix Type	Typical Use	Acceptable Coarse Aggregate(s)	Acceptable Fine Aggregate(s)	Coarse Aggregate Size, 100% Passing
DFC (Dense Friction Course)	Premium Surface Course for High Traffic Volume Roads Elevated Skid Resistance Properties	Trap Rock, Dolomitic Sandstone, Meta-Arkose, Diabase or Andesite	Trap Rock, Dolomitic Sandstone, Meta-Arkose, Diabase or Andesite	16.0 mm
HL 2	Fine Mix for Driveways and Boulevards Requiring Considerable Hand Work	N/A	Aggregate meeting Physical & gradation specification	13.2 mm
HL 3 (HS)	High Stability surface & levelling course mix for roads with mixed heavy truck, bus and car traffic	100% Crushed Virgin Material	100% Crushed Virgin Material	16.0 mm
HL 3F	Surface course mix for low volume roads and where hand work is required (i.e. driveways, boulevards)	Aggregate meeting Physical & gradation Specification	Aggregate meeting Physical & gradation specification	16.0
HL 8	Binder Course for roads and parking lots with mainly Car Traffic	Aggregate meeting Physical & gradation Specification	Aggregate meeting Physical & gradation specification	26.5 mm
MDBC (Medium Duty Binder Course)	Binder Course for Mixed Truck and Car Traffic	Aggregate meeting physical & gradation specification; up to 20 % RAP Permitted	Aggregate meeting physical & gradation specification; up to 20 % RAP Permitted	26.5 mm
HL8 HS/ HDBC (Heavy Duty Binder	High Stability Binder Course for Roads, & Intersections with Heavy Truck Traffic	100% Crushed Material	100% Crushed Material	26.5 mm

Hot Mix Type	Typical Use	Acceptable Coarse Aggregate(s)	Acceptable Fine Aggregate(s)	Coarse Aggregate Size, 100% Passing
Course)	(>10%) & Bus Routes (>2000 AADT)			

Notes: 1. For DFC, coarse and fine aggregates shall be obtained from the same source.

2. Aggregate shall be: traprock, or dolomitic sandstone.
Aggregates for DFC shall be from sources on the current MTO DSM list. Irrespective of physical properties, the Owner may accept of reject aggregates based on past performance.

14.04 Asphalt Cement

Asphalt cement shall conform to OPSS MUNI 1101. OPSS MUNI 1101, Appendix B requirements for QA acceptance testing are not part of this specification.

14.04.1 Asphalt Cement Grade

The asphalt cement grade for virgin aggregate mixes that do not contain Reclaimed Asphalt Pavement (RAP) shall be PG 58-28, unless otherwise specified. For mixes incorporating up to and including 20% RAP, the asphalt cement grade shall be PG 58-28. Irrespective of the traffic loading conditions, mixes containing 21% RAP to 30% RAP shall incorporate PG 52-34 asphalt cement. A change in grade of asphalt binder may be considered if the request is submitted in writing to the Owner prior to paving, and only if the grade of asphalt is at least one grade higher than the original grade submitted with the approved mix design.

14.05 Aggregates

Asphalt aggregate physical properties shall conform to OPSS 1003, Tables 1 and 5. Aggregate physical properties shall be reported on forms provided in OPSS 1003, Appendix B and C.

14.05.1 Gradation Properties

Hot mix asphalt fine and coarse aggregate components shall meet the gradation requirements of Tables D-1 and D-2 respectively in Appendix D of OPSS 1003. The specified

total aggregate blends for the various mix classifications are given in Table 2 of OPSS 1150.

14.06 Mix Designs

Mix designs shall be completed in accordance with OPSS 1150.04.01.02.02.

Submission of mix designs for review, approval, or rejection, shall be contingent upon the information listed in OPSS 1150.04.02.03 being submitted to the Owner.

The owner reserves the right to make the mix design approval contingent upon the successful duplication of the mix design Marshall properties by the Owner's designated QA testing laboratory.

14.06.1 Design Properties

Tables 3, 4, 5, and 6 of OPSS 1150 are replaced by the required mix design properties presented in Table 2 of this specification. Voids in the Mineral Aggregate (VMA) requirements are specified in OPSS 1150, Table 7.

TABLE 2

MARSHALL MIX DESIGN PROPERTIES

MARSHALL PROPERTY	DFC	HL 3 HS	HL 3 FINE	HL 2	HL 8	HDBC (HL8 HS)	MDBC
MINIMUM STABILITY N @ 60 ^{O}C	8,960	12,000	8,000	5,000	8,000	12,000	12,000
MINIMUM FLOW (Units of 0.25 mm)	8.0	8.0	8.0	9.0	8.0	8.0	8.0
AIR VOIDS %	3.2 - 3.8	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0
MINIMUM ASPHALT CEMENT CONTENT **%**	See Note 1	5.3	5.5	6.0	5.2	5.2	5.2

Note 1: The minimum asphalt cement content for DFC shall be as per OPSS 1150, Table 3.

14.0.7 Commencement Of Paving And Placing Asphalt

This section amends OPSS 310.07.06 with the following.

14.07.1 Commencement Of Paving

Unless otherwise approved by the Owner, asphalt surface course paving shall not be carried out after the end of the first full week of October.

Binder course asphalt paving shall not proceed after the third full week of November unless approved by the Owner.

14.07.2 Placement Of Asphalt Mixture

OPSS 310.07.06.01 is amended by the following:

The temperature of the mixture delivered to the job site shall not exceed 185 ^{O}C.

The temperature of the mixture immediately after spreading, and before initial rolling, shall not be less than 135 ^{O}C.

14.08 Quality Assurance

The hot mix asphalt quality will be determined on the basis of QA test data compared to allowable tolerances from the approved JMF as set out in OPSS 1150, Table 8.

The hot mix asphalt compaction shall be assessed on the basis of nuclear density gauge testing. Nuclear density gauge data alone will not be used to reject asphalt mix compaction.

14.08.1 Compaction

Asphalt compaction testing during the placement and rolling stage shall be by nuclear density gauge. OPSS 310 Table 10 is amended and the criteria for assessing mix compaction by nuclear density gauge is given in Table 3. The specified compaction is expressed as a percentage of the Marshall Maximum Relative Density (MRD), as established from the approved asphalt mix design for the project, and verified by QA testing.

The frequency of nuclear gauge testing in OPSS 310.08.04.02

is amended such that compaction of a given area of pavement shall be assessed by a minimum of five nuclear density test readings. The pavement area to be assessed should be a maximum of 0.5 lane-km of pavement (i.e. 250 m of 2 lane pavement). The average of at least five nuclear readings for a given area shall not be less than the specified percent compaction given in Table 3, with no individual test results being more than 3 % below the specified percent compaction.

Nuclear density test results will be used as a guide to assessing in-place compaction and will not be used to reject the mix compaction. Where compaction results by nuclear gauge do not meet the specifications, the Owner may elect to have cores (minimum 100 mm diameter) taken to assess the in-place mix density. The core density and compaction data shall be determined according to OPSS 310.08.04.03. Where compaction results from core densities do not meet specifications and are below the specified values of 93% MRD for HL3 (HS), HL 4, HL 2, HL 8, and MDBC and 93% MRD for DFC and HDBC (HL8 HS), the coring and testing will be at the contractor's expense.

TABLE 3
COMPACTION CRITERIA BY NUCLEAR GAUGE
FOR ACCEPTANCE OR REJECTION

MIX TYPE	AVERAGE OF COMPACTION RESULTS BASED ON NUCLEAR DENSITIES (% MRD)			
	MEETS SPECIFICATION	ACCEPTABLE	BORDERLINE	REJECTABLE
Surface Course: HL 4, HL 3 (HS), HL 2 DFC	≥ 93 % ≥ 92 %	< 93 % & ≥ 92 % < 92 % & ≥ 91 %	< 92 % & ≥ 90 % < 91% & ≥ 89 %	< 90 % < 89 %
Binder Course: HL 8 & MDBC HDBC (HL 8HS)	≥ 93 % ≥ 92 %	< 93 % & ≥ 92 % < 92 % & ≥ 91 %	< 92 % & ≥ 90 % < 91% & ≥ 89 %	< 90 % < 89 %

14.08.2 QA Field Sampling

OPSS 310.08.01 is amended to include the following:

Field samples for QA testing shall be plate samples (minimum 300 mm x 300 mm) obtained during asphalt placement and compaction procedures. Samples obtained from the spreader hopper or truck box shall not be used for QA testing.

Samples shall be collected by the contractor at locations generated by random numbers as agreed with the Owner, for longitudinal chainage and transverse offset from edge of pavement. These samples shall be representative of the main lane paving operations. At each location, the contractor shall take three samples (within a 3 m longitudinal length) and the samples shall be packed in separate cardboard boxes supplied by the contractor. The box samples shall be numbered in sequence for a given contract, and shall be marked “A”, “B”, and “C” and include the following minimum identification: date; longitudinal chainage or municipal address opposite the sample location; offset in metres from edge of pavement; contract number, and street name. A typical sequence of samples would be identified as 1A, 1B, 1C, and 2A, 2B, and 2C.

Two of the plate samples from each sample location shall be the property of the Owner. The contractor shall obtain and complete a Bituminous Sample Identifier Forms for each sample. The asphalt mix samples designated for the Owner shall be given directly to the Owner’s representative at the paving site.

14.08.3 QA Sampling And Testing Frequency

OPSS 310.08, Table 6, is amended and replaced by Table 4 in this specification.

TABLE 4
CRITERIA FOR SAMPLING AND TESTING TO DETERMINE IN-PLACE ASPHALT CEMENT CONTENT

MIX TYPE	MINIMUM TEST SAMPLES BASED ON ASPHALT PLANT'S DAILY MIX PRODUCTION		
	≤ 500 tonnes/day	> 500 tonnes & < 1000 tonnes/day	≥ 1000 tonnes/day
Surface Course	2	3	1 per 500 tonnes
Binder Course	1	2	1 per 500 tonnes
HMA in Driveways, Boulevards and Pathways	Field decision by Owner's representative		

14.09 Price Adjustment Provisions

Prior to the start of construction, the Owner and the contractor have the option to agree and invoke the price adjustment provisions of the contract. Price adjustment provisions apply only to main lane paving operations with total production of 2500 tonnes of more for each mix type. The price adjustment shall be based on Average Asphalt Cement Content (AACC) and/or Average Mix Compaction (AMC) determined by core densities.

14.09.1 Criteria For Price Adjustment Or Rejection And Removal Based On Asphalt Content

The average asphalt cement content shall be determined for a given lot size of mix production from a single plant location. For an evaluation of a given lot, a minimum of 5 sets of test results shall be used.

Where the average asphalt cement content (AACC) of the in-place mix for the given mix production quantity being evaluated does not meet the requirements of this specification, and the Owner and contractor have agreed to invoke the pay adjustment provisions of the specification, the bid price for the supply and placement of hot mix asphalt by the tonne shall be subject to a price adjustment. A minimum of 5 sets of test results must be used in the evaluation of the mix. This can include asphalt paving over one or more days.

Payment for hot mix asphalt shall be subject to the adjustments in the bid price, per tonne of mix, based on the criteria in Table 5. The pay adjustment shall be determined from the average asphalt cement content (AACC) compared to the Job Mix Formula Asphalt Cement Content (JMF_{ACC}).

TABLE 5-PRICE ADJUSTMENT BASED ON AVERAGE ASPHALT CEMENT CONTENT

Criteria For Pay Adjustment	Pay Adjustment on Tender Price
$AACC > (JMF_{ACC} + 0.7)$	no payment, mix to be removed
$(JMF_{ACC} + 0.6) < AACC \leq JMF_{ACC} + 0.7)$	2% penalty
$(JMF_{ACC} + 0.5) < AACC \leq JMF_{ACC} + 0.6)$	1% penalty
$(JMF_{ACC} + 0.3) < AACC \leq (JMF_{ACC} + 0.5)$	no pay adjustment
$(JMF_{ACC} + 0.2) < AACC \leq (JMF_{ACC} + 0.3)$	2% bonus
$(JMF_{ACC} + 0.1) < AACC \leq (JMF_{ACC} + 0.2)$	1 % bonus
$(JMF_{ACC} – 0.1) \leq AACC \leq JMF_{ACC} + 0.1)$	no pay adjustment
$(JMF_{ACC} – 0.2) \leq AACC < (JMF_{ACC} – 0.1)$	1 % penalty
$(JMF_{ACC} – 0.3) \leq AACC < (JMF_{ACC} – 0.2)$	2 % penalty
$(JMF_{ACC} – 0.4) \leq AACC < (JMF_{ACC} – 0.3)$	3 % penalty
$(JMF_{ACC} – 0.5) \leq AACC < (JMF_{ACC} – 0.4)$	5 % penalty
$AACC < (JMF_{ACC} – 0.5)$	no payment, mix to be removed

Where the average asphalt cement content for the asphalt quantity being evaluated is 0.5% or more below the JMF asphalt cement content, the Owner shall direct the contractor to remove and replace the asphalt mix at no cost to the Owner.

Where the average asphalt cement content for the asphalt quantity being evaluated is 0.7 % or more above the JMF asphalt cement content, the Owner shall direct the contractor to remove and replace the asphalt mix at no cost to the Owner.

Where an individual test result is rejectable (i.e. more than 0.5% below or 0.7% above the JMF average cement content) the test result shall not be included in the price adjustment calculations.

The contractor may request re-testing of the rejected material. All costs of re-testing will be borne by the contractor if the results of the re-test are rejectable. The area represented by the sample shall be subject to removal and replacement of the asphalt mix at no cost to the Owner. The limits of the removal and replacement will be from the mid-point location between the rejected sample and the last acceptable sample, and the next acceptable sample unless the contractor undertakes to determine the limits of the removal area by a coring and testing program at his costs.

14.09.2 Criteria For Price Adjustment Based On Compaction Determined By Core Densities

This section of the specification shall only apply to main lane paving operations on full reconstruction projects, or resurfacing contracts that include padding and/or a scratch coat of hot mix asphalt to provide a levelling course.

Where the Average Mix Compaction (AMC) of the in-place mix does not meet the requirements of this specification, payment shall include price adjustment for compaction determined by core densities, as outlined by criteria in Table 6.

TABLE 6
PRICE ADJUSTMENT BASED ON COMPACTION DETERMINED FROM CORE DENSITIES

Average Mix Compaction (%MRD by Cores)	Price Adjustment
AMC $\geq$ 95%	Bonus – 2% of bid price
95 > AMC $\geq$ 94%	Bonus – 1% of bid price
94 > AMC $\geq$ 92%	no price adjustment
92 > AMC $\geq$ 91%	penalty price adjustment = 2%
91 > AMC $\geq$ 90%	penalty price adjustment = 3%
90 < AMC $\geq$ 89%	penalty price adjustment = 5%
AMC < 89%	mix to be removed

Asphalt layer thicknesses that are less than 35 mm shall not be used in the assessment of in-place mix compaction.

Where the assessment of asphalt compaction indicates borderline conditions, additional cores and testing may be undertaken to further assess the asphalt mix compaction. If the Owner elects to not undertake additional coring and testing, asphalt compaction will be considered to be acceptable.

14.10 Payment For Asphalt Mix

Unless otherwise specified in the tender documents, payment for asphalt satisfactorily placed and compacted will be by the tonne. Where price adjustment provisions are invoked for the contract, the final payment shall reflect the adjustments for asphalt cement content and/or compaction. For all mixes except DFC the pay quantity by the tonne will be based on the weigh tickets for mix supplied to the job site.

14.10.1 Dense Friction Course (DFC)

For DFC, the estimated contract tonnage quantity is based on mixes incorporating trap rock aggregate as the baseline material. A multiplier factor will be applied to the weigh ticket total to account for mixes produced with different aggregates that result in lower compacted bulk relative densities. Table 7 provides typical mix densities with different approved aggregates, and the multiplier factor that applies to each aggregate type.

TABLE 7 - MULTIPLIER FACTORS FOR DFC

AGGREGATE TYPE	APPROXIMATE MIX DENSITY (t/m^3)	MULTIPLIER FACTOR
Traprock	2.650	1.000
Diabase	2.570	1.031
Meta-Arkose	2.460	1.077
Dolomitic Sandstone	2.420	1.095

The multiplier factor will be determined by dividing the Traprock mix baseline density by the bulk density of the mix to be used, as established by the mix design, using the following equation:

$$\text{DFC Multiplier Factor} = \frac{2.650 \ (t/m^3)}{\text{Mix design BRD } (t/m^3)}$$

14.10.2 Asphalt Cement Price Adjustment Based on Price Index

The Owner will adjust the payment to the contractor based on changes to the Ministry of Transportation's performance graded asphalt cement Price Index, and as set out in OPSS 310, Appendix 310-B. The Price Index will be used to calculate the amount of the payment adjustment per tonne of asphalt cement accepted into the Work. Payment will be made based on the month the asphalt is laid.

The contractor is advised that the supply of liquid asphalt and the allowance for an adjustment in the supply price of liquid asphalt does not constitute "Extra Work", "Additional Work", or "Changes in the Work" as defined in clause GC 3.10 and outlined in payment clause GC 8.02.04 of the General Conditions. Payment for the liquid asphalt price adjustment shall be determined as indicated in OPSS 310, Appendix 310-B. No mark-up shall be applied to the calculated payment for the liquid asphalt price adjustment regardless of the extent to which work is assigned or sublet to others.

Notes:

1. Contractors should bid the hot mix asphalt item using the cost of the PGAC in effect at the time of tender closing unless specified in the Contract Document. The asphalt cement Price Index is only a tool for qualifying hot mix prices and is not intended as a standard asphalt cement price to be incorporated into the contract bid.

2. The payment adjustment calculated is full compensation for any and all PGAC grades specified.

14.11 Dispute Resolution

The following outlines the methodology for resolving disputes regarding testing and evaluation of mixes for price adjustment based on asphalt cement content, and compaction based on core densities.

14.11.1 Price Adjustment Based On Asphalt Cement Content

Where there is disagreement on the findings of the test results by the Owner's designated QA laboratory, the contractor has the option of requesting the services of a referee laboratory. The referee laboratory shall have current CCIL Type A certification and the selection of the laboratory

shall be mutually agreed upon by the Owner and the contractor.
Samples for referee testing shall be from the triplicate plate samples taken during paving. The Owner shall arrange for transfer of referee samples to the designated referee laboratory.

The results of the referee laboratory will be binding on both the Owner and the contractor. Payment for the costs of the referee testing and sample delivery will be the responsibility of the contractor if the test results confirm that the mix material does not meet specification. If the referee laboratory test results indicate that the mix material satisfies the specifications with respect to asphalt cement content, the costs will be borne by the Owner.

14.11.2 Acceptance Or Rejection Of Mix Compaction Based On Core Densities

Where there is disagreement on the compaction findings from the core test results by the Owner's designated QA laboratory, the contractor has the option of requesting additional cores and using the services of a referee laboratory. The cores shall be taken at locations selected jointly by the contractor and the Owner. At each core location, a parallel core shall be taken by the contractor and provided to the Owner. The contractor and the Owner shall agree on the CCIL certified laboratory to carry out the core testing.

The results of the referee laboratory will be binding on both the Owner and the contractor. Payment for the costs of the coring, referee testing and core sample delivery will be the responsibility of the contractor if the test results confirm that the mix material does not meet the compaction specification. If the referee laboratory test results indicate that the mix compaction satisfies the specifications, the costs will be borne by the Owner.

B15 - Asphalt Walkways & Driveways

(Note: This item, when used in conjunction with separate items in the Schedule of Tender Unit Prices for excavation, granular etc., is intended to cover the additional handwork, etc. not covered in the unit prices.)

The provisions of OPSS 311, OPSS 314 and Special Provision B14 shall apply except as amended or extended herein.

The following shall be included under this item.

Sawcutting, excavation and placement of Granular "A" base and asphalt to the following depths:

(a) Residential Driveways/Walkways: 50 mm HL3F + 200 mm Granular "A";

(b) Commercial Driveways: 40 mm HL3F + 50 mm HL8 MDBC + 300 mm Granular "A";

(c) Industrial Driveways: 40 mm HL3F + 50 mm HL8 MDBC + 375 mm Granular "A";

The Granular "A" base shall be compacted to 100% of the maximum dry density.

No separate payment shall be made for the sawcutting required.

Payment for excavation, granular "A" and asphalt shall be included under the items included in the Schedule of Tender Unit Prices. Where no separate items are identified in the Schedule of Tender Unit Prices, the unit price for the Asphalt Walkways and Driveways item shall include the excavation and supply and placing of granular "A" and asphalt necessary to complete this item.

Measurement for payment will be as per OPSS 311.09.01.

B16 - Concrete Driveways

(Note: This item, when used in conjunction with separate items in the Schedule of Tender Unit Prices for excavation, granular etc., is intended to cover the additional handwork, etc. not covered in the unit prices.)

OPSS 350 applies to this item and the unit price bid for the concrete driveways shall include the following:

- Sawcutting, excavation and construction of a granular base to the following depth:

  (a) Residential Driveways: 75 mm Granular "A" + 150 mm Concrete;

  (b) Commercial and Industrial Driveways: 150 mm Granular "A" + 150 mm concrete.

- Driveway concrete thickness shall match the existing thickness to a

minimum of 150 mm. Increased thickness, when authorized, will be pro-rated.

- Granular "A" base shall be compacted to 100% of the maximum dry density and shall be included in the unit price for this item, unless a separate Granular "A" item is included in the Schedule of Tender Unit Prices.

Payment for excavation, granular “A” and concrete shall be included under the items included in the Schedule of Tender Unit Prices. Where no separate items are identified in the Schedule of Tender Unit Prices, the unit price for the Concrete Pavement and Driveways item shall include the excavation and supply and placing of granular “A” and concrete necessary to complete this item.

Measurement for payment will be as per OPSS 350.09.01.

B17 - Adjust Paving (Stone) Brick Driveway

The unit price bid for this item shall include the disassembling and stockpiling of the paving stones, excavation, filling, construction of a 300 mm granular base with Granular "A" compacted to a density of 100 percent of the maximum dry density and overlain by 50 mm of limestone screenings, placing the paving bricks to the proposed grade and the filling of the voids in the completed brick work with limestone screenings. The granular base shall be included in the unit price for this item.

The Contractor shall replace any paving bricks broken as a result of this work or stolen from the stockpile, at no additional cost to the owner.

The work shall include any cutting of the paving stones required to match the new grade.

The quantity of paving brick driveway adjustment to be paid for will be the number of square metres of driveway adjusted based on field measurements.

Payment shall be full compensation for all equipment, labour and materials required to do the work.

B18 - Granular Driveways

(Note: This item, when used in conjunction with separate items in the Schedule of Tender Unit Prices for excavation, granular etc., is intended to cover the additional handwork, etc. not covered in the unit prices.)

The provisions of OPSS 314 apply except as amended or extended herein. This item shall include the following:

- Granular driveways shall include excavation and placement of Granular "A" to the following depths:

- Residential: 200 mm
- Commercial: 300 mm
- Industrial: 375 mm

Payment for excavation and granular “A” shall be included under the items included in the Schedule of Tender Unit Prices. Where no separate items are identified in the Schedule of Tender Unit Prices, the unit price for the Granular Driveways item shall include the excavation and supply and placing of granular “A” necessary to complete this item.

Measurement for payment will be as per OPSS 314.09.01.01.01.

B19 - Regrading of Ditches and Swales

The provisions of OPSS 206 apply except as amended or extended herein. This item shall include the following:

- Cut and/or fill of existing ditches/swales to provide drainage. The average cut or fill is +/- 150 mm.

- Following regrading, the work area shall be fine graded and made ready for topsoil and sod or seed. Tolerance in elevation shall be 25 mm.

Measurement for payment will be per linear metre, measured along the centre line of the ditch or swale.

B20 - Hand Laid Riprap With Filter Cloth

The provisions of OPSS 511 shall apply except as otherwise amended or extended herein.

This item shall include the following:
Riprap shall be placed as shown on the contract drawings, and as directed by the Contract Administrator. Riprap shall be 200 - 250 mm in size and to be placed to a minimum depth of 300 mm over filter fabric. Wherever riprap is to be placed, the ground is to be over-excavated, so that the finished surface of the riprap is even with the adjacent surface. All fallen trees and debris are to be removed from area of riprap before placement of filter fabric. Filter fabric shall extend at least 300 mm beyond the edge of riprap and shall be towed into a depth of 300 mm at edges. Filter fabric to be 270 g/m^2, or heavier.

Unit price bid shall include all labour, equipment and materials to install riprap and

filter fabric, and shall include the over excavation and disposal of surplus material.

Measurement for payment will be in square metres.

B21 - Topsoil and Sod

The provisions of OPSS 802 and 803 apply except as amended or extended herein.

Topsoil gained from earth excavation can be reused for this work. If sufficient topsoil is not available on site, the Contractor shall supply additional topsoil for this work at no additional cost to the Owner. Imported topsoil must be approved by the Contract Administrator prior to arrival on site

The unit price bid shall also allow for the supply and application of fertilizer and water to ensure good growth.

Measurement for payment shall be per square metre of area topsoiled and sodded.

Warranty for sod shall commence upon completion of installation and shall continue for 120 days.

B22 - Topsoil, Seed and Mulch

The provisions of OPSS 802 and 804 and Special Provisions B21 apply except as amended or extended herein.

(a) Measurement for payment shall be in metres squared, actually placed.

(b) The Contract Administrator shall choose between hydraulic and straw mulching depending on the time of year during which areas will be ready for seeding.

(c) Topsoil may be stockpiled or imported.

(d) Topsoil, seed and mulching is to be placed to midpoint of the shoulder rounding on rural cross-section.

B23 - Supply and Apply Calcium Chloride

The provisions of OPSS 506 apply except as amended or extended herein.

The contractor must have a minimum of one tonne of calcium chloride available

on the site at all times for dust control only. This item shall only be used at the direction of the Contract Administrator.

Calcium chloride shall be applied uniformly by means of a mechanical spreader when and as directed by the Contract Administrator.

Calcium chloride will be measured in tonnes for that quantity used in the work for compaction and dust control. The unit price bid shall be full compensation for the supply and application of calcium chloride.

B24 - Application of Water for Dust Control

The Contractor will arrange for the supply of water from the Municipality.

Water may be supplied by the Municipality from approved fire hydrants.

Water shall be applied by means of an approved equipment capable of distributing it uniformly and with proper control.

Measurement for payment shall be as per OPSS 506.09.01.

B25 - Cold Mix, Open Graded Bituminous Pavement

The provisions of OPSS 309 shall apply except as amended or extended herein.

Materials

Emulsified Asphalt

The bituminous material used for mixing shall meet the requirements of CMS-2, Emulsified Asphalt, as specified in OPSS 1103.

For the duration of this contract, the Contractor's supplier of asphalt cement must be on the MTO designated suppliers list.
Included with the Form of Tender on Statement "B" shall be the name of the asphalt cement supplier. Asphalt cement supplied by companies not on the MTO designated suppliers list will not be accepted on this project.

The unit price bid shall include the supply of asphalt cement used in the mix.

Aggregate General

Aggregates of the type and quality specified shall be in accordance with the provisions of OPSS l001, "Material Specification for Aggregate - General" and

OPSS 309.05.02, Tables 2 and 3. Sufficient material to complete the work shall be stockpiled prior to commencing the paving operation.

Coarse Aggregates

Coarse aggregate for mixing shall meet the gradation and physical requirements of CL-4 open graded aggregate.

Choke Aggregate

The aggregate used for choke material shall meet the requirements of OPSS 1006 for Class 3 aggregate.

Composition of Mixture

The mix proportion shall be determined by the Contractor using established laboratory test methods for each source of aggregate.

The test results shall be submitted to the Owner, one week prior to the production of the mixture on the contract.

The test results shall include:

(i) Test methods employed

(ii) Proposed emulsion content

  (a) percentage by mass
  (b) litres per tonne of aggregate

(iii) Proposed residual asphalt content percentage by mass

No mix shall be supplied under the contract until the proposed mix formula has been approved by the Contract Administrator.

The allowable tolerance of the residual asphalt content as determined by the extraction test shall be $^{+}_{-}$ .3 per cent of the mix formula.

Equipment

The mixture shall be mixed and placed using a Midland Mix Paver or approved equivalent. The mixture shall be compacted with a steel wheeled roller meeting the Class "S" requirements, OPSS 3l0.06.02. The choke stone shall be rolled using a self-propelled pneumatic-tired roller as per OPSS 3l0.06.02, Class R.

Construction Requirements

The mixture shall be placed in accordance with all specification requirements except that a trail application will not be required.

Work can only proceed when the minimum ambient temperature is $10^{o}C$ and rising.

The clear aggregate and emulsion shall be sufficiently mixed so that the bituminous material is uniformly distributed throughout and all aggregate particles are uniformly coated.

The Mix Paver shall be guided by an approved method such as a stringline set from the staked alignment. This means of control shall be established on each side of the road.

The mixture shall be mechanically spread by the Mix Paver at a uniform depth and crossfall (2%) as required. The finished surface of the pavement shall be tested with a 3 m straight edge laid parallel with the centre line of the pavement. Any area exceeding a 7 mm variation from the surrounding area shall be satisfactorily corrected or removed and replaced at the Contractor's expense.

Breakdown rolling shall be delayed until surface breaking of the emulsion has occurred.

The Contractor will be responsible to cover all emulsion runout on the sides of the road with choke aggregate to prevent the pickup and tracking of the emulsion by private vehicles.

Following breakdown rolling, the choke aggregate will be mechanically spread uniformly across the width of the fresh mat. Sufficient choke will be applied to prevent pickup by traffic. The final rolling with a self-propelled pneumatic-tired roller shall key in the choke aggregate and remove any marks remaining from breakdown rolling.

Traffic shall not be allowed on the fresh mat until the choke has been applied and final rolling is complete.

The exposed vertical face at the centreline edge of pavement shall be free of choke aggregate to ensure a good bond at the longitudinal joint. Contamination of the exposed face by the choke aggregate will necessitate removal or spraying with emulsion of the contaminated area.

It is anticipated that the maximum finished lift will be 75 mm in thickness. It may be necessary, if requested by the Contract Administrator, to place a levelling or scratch course in some areas prior to placement of the surface course. Where a scratch coat is necessary, the thickness of the scratch coat will generally be 25 mm. The cost of this scratch test shall be included in the unit price bid for

cold-mix asphalt.
When a second course is required, loose choke material shall be broomed from the surface of the binder course prior to placing the surface course. No bituminous mixture shall be placed over a previous course less than 24 hours after final compaction of the latter.

Any area determined to be unacceptable by the Contract Administrator shall be removed and replaced by the Contractor at his expense.

Any aggregate spilled in front of the Mix Paver shall be immediately removed.

Measurement for Payment

For purposes of payment, the quantity of `coarse' aggregate used in the work shall be deemed to be the total amount of tonnes of cold-mix placed under this contract. The weight of the emulsion and choke aggregate shall not be taken into consideration for payment purposes.

Basis of Payment

Payment at the contract unit price per tonne shall be payment in full for brooming of the existing road surface; supplying asphalt emulsion as required in the mixture; supplying, handling, hauling, mixing with emulsion, placing, and rolling of the `coarse' aggregate; supplying, handling, hauling, spreading and rolling of the choke aggregate; and for all other operations necessary to complete the work in accordance with this Special Provision and for which payment is not otherwise provided.

Supply and Application of Seal Coat

General

All work under this contract shall be in accordance with OPSS-304 except that the measurement for payment under each respective item shall be at the unit specified in the Form of Tender.

For the duration of this contract, the Contractor's supplier of asphalt cement must be on the MTO designated suppliers list. Asphalt cement supplied by companies not on the MTO designated suppliers list will NOT be accepted on this project.
Prior to commencement of work, the Contractor shall submit to the Owner, detailed information of the materials, (e.g. aggregate, gradation, source, emulsion type, etc.) intended to be used on this portion of the project and supply sufficient material for testing purposes. Only materials tested and approved by the Contract Administrator shall be used on this project.

The Contractor shall be responsible for the placement of protective covers for

manholes, catch basins, valve boxes and curbs to the approval of the Contract Administrator. The protective covers shall be removed at the completion of surface treatment on the roadway or days end, whichever comes first.
The Contractor must provide pedestrian and vehicular access to private homes and commercial properties.

After the placing of the cold-mix asphalt, the Contractor shall apply a "seal coat" to the surface using HF-150 S Emulsion and 6.7 mm clear aggregate.

The surface treatment seal coat shall be applied when a minimum period of 15 days has elapsed following the application of the cold-mix asphalt overlay.

The rates of application for the surface seal of cold-mix asphalt are as follows:

1.65 to 1.9 L/m^2 for emulsion and 12 to 14 kg/m^2 for the 6.7 mm clear aggregate.

Supply and Application of Aggregates

The 6.7 mm clear aggregate for this item shall be a washed material meeting the following gradation requirements:

Ministry Sieve Designation	Percent Passing
9.5 mm	100
6.7 mm	90-100
4.75 mm	50-100
2.36 mm	10-40
1.18 mm	0-10
300 m	0-7
150 m	0-5
75 m	0-1

The unit price bid shall include any hand spraying of emulsion and hand spreading of aggregate as may be required.

Construction Schedule

The Contractor shall submit to the Owner his proposed construction schedule indicating the order of road sections to be surface treated and the estimated time required to complete each section within one week after the awarding of this tender.

Field Sampling

The Contractor shall make specific note of this special provision. Field sampling to determine the amount of binder and aggregate application may be required, dependent upon the contractor's quality assurance.

Should the amount of binder and aggregate suspected to be unacceptable by the Contract Administrator, the Contractor shall conduct field sampling in the presence of the Contract Administrator, to determine the amount of binder and aggregate applied to the road in accordance with the Ministry of Transportation Testing Procedures.

Acceptance

If the test result is within $^{+}$ 5% of the desired application rate, the test result is considered acceptable and work may proceed.

If the test result is not within $^{+}$ 5% of the desired application rate, the test result is considered unacceptable and work must be stopped and adjustments made to the distributor. Field sampling must be repeated in a maximum of 50 m test strips until two consecutive acceptable test results or four unacceptable test results are obtained.

When two consecutive acceptable test results are obtained, work may proceed. When four unacceptable test results are obtained before two consecutive acceptable test results, the distributor shall be permanently removed from the job.

Basis of Payment

Payment at the contract price for the above tender items shall be full compensation for all equipment, labour and materials required to carry out the field sampling and patching.

References

The following publications are referred to in this Special Provision:
MTO "Traffic Control Manual for Roadway Work Operations"
MTO Manual of Uniform Traffic Control Devices (M.U.T.C.D.)
Canadian General Specifications Board (C.G.S.B.)

B26 - Surface Treatment

Supply and Application of HF150S Emulsion

The provisions of OPSS 304 apply except as amended or extended herein.

The unit price bid shall be deemed to have included all labour, materials and equipment necessary to supply, heat and place the emulsified asphalt.
Payment shall be based upon the tendered unit price and number of litres of emulsion supplied and placed as determined by field readings as recorded by the Owner's representative.

Supply and Place Class 2 Aggregate

OPSS 304 and 1001 will apply except as amended or extended herein.

The work shall include all labour, materials and equipment necessary for supplying, handling, hauling, spreading, brooming and rolling and for all other operations necessary to complete the work.

Payment shall be based upon the contract unit price and the number of tonnes of material supplied, placed and compacted as determined by weigh tickets received at the site by the Owner's representative.

Materials

(a) Emulsified Asphalt

The bituminous material used for mixing shall meet the requirements of HF150S, Emulsified Asphalt, as specified in OPSS 1103.

For the duration of this contract, the Contractor's supplier of asphalt cement must be on the MTO designated suppliers list.
Included with the Form of Tender on Statement "B" shall be the name of the asphalt cement supplier. Asphalt cement supplied by companies not on the MTO designated suppliers list will not be accepted on this project.

The unit price bid shall include the supply of asphalt cement used in the mix.

(b) Aggregate General

Aggregates of the type and quality specified shall be in accordance with the provisions of OPSS 1001, "Material Specification for Aggregate - General" and OPSS 309.05.02, Tables 2 and 3. Sufficient material to complete the work shall be stockpiled prior to commencing the paving operation.

Construction Requirements

The emulsified binder and aggregate shall be applied in accordance with all specification requirements.

Work can only proceed when the minimum ambient temperature is 10^{o}C and rising and the surface has been prepared to the satisfaction of the Contract Administrator.

Field Sampling

The Contractor shall make specific note of this special provision. Field sampling to determine the quality and the amount of binder and aggregate application may be required, dependent upon the contractor's quality assurance.

Should the amount of binder and aggregate suspected to be unacceptable by the Contract Administrator, the Contractor shall conduct field sampling in the presence of the Contract Administrator, to determine the amount of binder and aggregate applied to the road in accordance with the Ministry of Transportation Testing Procedures.

Acceptance

If the test result is within + 5% of the desired application rate, the test result is considered acceptable and work may proceed.

If the test result is not within + 5% of the desired application rate, the test result is considered unacceptable and work must be stopped and adjustments made to the distributor. Field sampling must be repeated in a maximum of 50 m test strips until two consecutive acceptable test results or four unacceptable test results are obtained.

B27 - Removal of Existing Items

The provisions of OPSS 510 apply except as amended or extended herein.

The unit price bid for the various items shall include the following:

- backfilling with Granular "A" and reinstating to existing conditions unless the applicable items are included in the Schedule of Tender Unit Prices
- sawcutting, excavating, separating and delivering any concrete or asphalt material to an approved recycling facility.

The unit price bid per metre for the removal of culverts shall also include the removal of all headwalls.

Owners shall specify if asphalt removal is payment for removal and disposal or if payment is a handling surcharge.

Measurement for payment for the various items to be removed will be as per

OPSS 510.10.

B28 - Steel Handrail

The provisions of OPSS 908 and OPSD 980.101 apply except as amended or extended herein.

Measurement for payment shall be as per OPSS 908.09.

B29 - Wire Mesh

The provisions of OPSS 905 apply except as amended or extended herein.

- Wire mesh shall be 152 x 152 MW11.1x11.1 (6 x 6 - 9 Gauge).

Measurement for payment for wire mesh will be per square metre of concrete sidewalk or concrete driveway installed with wire mesh.

B30 - Base Repairs - General

The provisions of OPSS 206, 310 and Special Provision B14 shall apply to this item and shall include the following:

- Pavement removal, excavation to maximum depth of 500 mm, Granular "A" backfill and pavement reinstatement as specified.

- On asphalt surfaces, the base repair area shall be reinstated with a minimum 50 mm HL8 MDBC and 40 mm HL3. On composite (asphalt on concrete) roads, the asphalt depth shall be a minimum of 100 mm HL8 MDBC and 50 mm HL3. Base repairs on roads to be resurfaced will require only HL8 MDBC asphalt. Concrete roads will require 150 mm of 30 MPa concrete. On concrete roads which require dowels, payment for same shall be under a separate item.

- Reinstatements shall be completed within 48 hours of the excavation.

Payment for sawcutting, Granular "A", HL8 and HL3 asphalt will be made under the appropriate items in the Schedule of Tender Unit Prices.

The quantity of base repairs to be paid for will be the number of square metres of base repairs carried out based on field measurements for either:

a) Asphalt pavement;
b) Concrete pavement, or:

c) Composite pavement.

B31 - Base Repairs - Flexible Pavement

(Note: This special provision is generally used with resurfacing contracts. The Schedule of Tender Unit Prices must include each of the sub items, (a) through (e), under this Base Repair item.)

(a) Base Repairs to Asphalt Pavement

The provisions of OPSS 206, 310 and Special Provision B14 shall apply except as amended or extended herein.

For the unit price bid, the Contractor shall be deemed to have made due allowance for the following:

(i) Excavation and disposal of asphalt pavement materials of up to and including 150 mm thickness for those areas marked on site for base repairs.

(ii) Excavation and disposal of up to and including 75 mm thickness of granular materials below the existing asphalt pavement.

(iii) Supply, placement and compaction of granular "A" to a density of 100 percent of the Standard Proctor Maximum Dry Density as backfill to the excavation to an elevation of 150 mm below the existing pavement or the milled asphalt pavement.

(iv) Supply, placement and compaction of 150 mm thickness of HL8 MDBC including the supply of asphalt cement used in the mix, to match the elevation and crossfall of the existing pavement or milled asphalt pavement.

(v) Supply and application of tack coat (SS-l Emulsion - OPSS 1103) around the edges of the repair, prior to HL8 paving.

The areas requiring base repairs will be painted by the Engineer for each street based on the Contractor's construction schedule and prior to the Contractor commencing repairs on each street. These areas will also be measured at the same time by the Engineer for payment purposes.

Any over-excavation by the Contractor shall be reinstated in accordance with the above specifications at the Contractor's expense. Any extension to those base repair areas due to unstable base material and as instructed by the Engineer, shall be measured on site for payment under this item.

Payment for this item shall be based on the number of square metres of base repair as measured in the field.

(b) Every 10 mm Increase in Asphalt Thickness

For every additional 10 mm increase in asphalt thickness, the payment for work under the base repair item shall be adjusted upwards. The unit price bid under this item shall include removal of 10 mm additional thickness of asphalt pavement and replacement with granular "A".

The average thickness of asphalt shall be verified on site by the Engineer. This average thickness will be calculated by averaging a minimum of two measurements per square metre of repair area.

(c) Every 150 mm Increase in Depth of Excavation

The bottom of the excavation shall be inspected and approved by the Engineer, prior to backfilling the excavation with granular "A".

Any soft materials below the specified depth shall be removed, disposed of and replaced with granular "A" in 150 mm lifts as directed by the Engineer.

Such sub-excavation shall be paid for under this item for every 150 mm increase in depth. Any additional excavation less than 150 mm shall be considered as 150 mm lift for payment purposes.

(d) Sub-base Repairs (Provisional)

It is anticipated that areas of the existing road base may break up during the construction period. The contractor will be required to avoid as much as possible any areas of the road that show great distress.

The Engineer will mark out any areas to be repaired. For the repair, excavate to a minimum depth of 300 mm below the existing road surface. Backfill the area up to the existing surface with Granular "A". Supply and place 100 mm diameter perforated subdrain, Big "O", high density, polyethylene pipe or approved equal, which shall be positively set to drain to the nearest roadside ditch. The subdrain shall be paid for separately as specified in Section (e) of this item. Compact the granular as specified as it is placed. Keep construction traffic from the area as much as possible if further signs of distress are shown. All costs associated with this item shall be deemed to be included in the unit price bid

(e) Subdrain (Provisional)

The subdrain shall be 100 mm diameter Big "O" heavy duty polyethylene

pipe, 300 kPa (Class 300), with sock filter or equivalent perforated high density polyethylene pipe with filter wrap.

The unit price bid shall also include all fitting connections to install the subdrain in its proper location and vermin traps on the outlet end.

Payment shall be made for the metres of subdrain laid as measured in the field.

B32 - Dowel Bars

The provisions of OPSS 1440 and 1442 apply except as amended or extended herein:

- The unit price bid shall include the supply and installation of 350 mm long, 20 mm diameter epoxy coated steel dowel bars in the existing slabs.
- The Contractor shall drill holes spaced at 450 mm centres in the middle of the vertical face at the end of the repair area.
- The work includes the grouting of the dowel bars into the slab with quick setting non-shrink mortar or epoxy.

The quantity of dowel bars to be paid for will be the number of dowel bars installed based on field measurements.

B33 - Stone Mastic Asphalt (SMA)

The provisions of OPSS 310, 1003 and 1151 shall apply except as amended or extended herein.

33.01.1 Introduction

Stone Mastic Asphalt is a gap graded hot mix asphalt surfacing material that incorporates fiber stabilized bituminous material. It comprises a high coarse aggregate content forming a skeleton that is partially filled with a mastic binder. SMA mix characteristics include superior rut resistance, excellent macrotexture and skid resistance, and low permeability.

SMA should be specified for use on roads with high traffic volumes and heavy commercial trucks, and/or high volume bus routes. Given that SMA surfaced roads have significantly lower tire noise than conventional hot mix asphalt. Consequently, SMA can be considered for specific sites where high traffic noise levels are an issue.

This specification specifically covers SMA using cellulose or mineral fibers and is applicable to fiber materials in bulk, or in pelletized form. Alternate methods of introducing fibers to hot mix asphalt, such as by shredded shingles, or in asphalt cement, are not covered by this specification.

33.02 References

The following references are specific to SMA mixes and are not provided in the main body of the specifications.

American Association of State Highway and Transportation Officials (AASHTO) Standards

T19	Determination of the Unit Weight and Volume of the Voids Between Coarse Aggregate in the Dry Rodded Condition
T89	Determination of Liquid Limit, Plastic Limit, and Plasticity Index of Soils
T283	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage (Determination of Tensile Strength Ratio, TSR)
T304	Determination of Uncompacted Void Content of Fine Aggregate
T305	Determination of Draindown Characteristics in Uncompacted Asphalt Mixtures
MP2	Superpave Volumetric Mix Design
TP4	Preparing and Determining the Density of Hot Mix Asphalt Specimens by Means of the SHRP Gyratory Compactor
MP8-00	Standard Specification for Designing Stone Matrix Asphalt (SMA)
MP41-00	Standard Practice for Designing Stone Matrix Asphalt (SMA)

National Center for Asphalt Technology (NCAT)

Designing Stone Matrix (Mastic) Asphalt Mixtures Volume IV - Mixture Design Method, Construction Guidelines, And Quality control Procedures; Transportation Research Record, July 1998

33.03 Definitions

The following definitions are specific to SMA mixes and are not referenced in the main body of the specifications.

33.03.1 Draindown Test

The test determines the portion of material that separates from the main sample of uncompacted SMA mix at elevated temperatures comparable to those encountered during production, transport and placement. Test values are reported in percent by mass. Draindown test procedures shall be used as outlined in AASHTO T305.

Stabilising Additives

Stabilising additives are materials added to the SMA mix to inhibit the loss of bituminous binder by drainage from the aggregate. Commonly used additives are cellulose fibers and mineral fibers. Modified binder asphalts are also used as stabilising additives.

Mastic (Mortar)

Mastic is the mortar comprised of fines, filler, asphalt binder and stabilising additive.

Nominal Maximum Aggregate Size (NMAS**)**

NMAS is one sieve size larger than the first sieve that retains more than 10 percent of aggregate.

Voids in Coarse Aggregate (V_{CA})

V_{CA} is the volume in between the coarse aggregate particles. This volume includes filler, fine aggregate, air voids, asphalt binder, and fiber.

Voids in the Coarse Aggregate - Dry-Rodded Condition (VCA_{DRC})

V_{DRC} is the volume between the coarse aggregate fraction as determined by AASHTO T19.

33.04 SMA Mix Specifications

The SMA mix specifications are presented as follows in terms of mix design and Job Mix Formula (JMF), mix properties, and mix components.

33.04.1 Mix Design And JMF

The asphalt mixture shall be composed of aggregate(s), mineral filler and asphalt cement, plus required additives and shall be combined as necessary to meet the project requirements. The mix design shall be in accordance with either the requirements of AASHTO MP8-00 using the gyratory compactor or the Marshall compaction method (50 blows per face) as outlined in the NCAT document dated July, 1998. The SMA mix design procedure focuses on achieving a specified air void content by adjusting the aggregate gradation to accommodate the required asphalt binder content.

It is the Contractor's responsibility to ensure that, in addition to the aggregate gradation requirements, the produced material will provide an asphalt mixture that conforms to the applicable design parameters listed in Table A-1.

The Contractor shall submit in writing to the Engineer the JMF for approval. The JMF shall include the information specified in the main specification document as well as the following additional information:

(a) The type and amount by weight of mix stabilizer additive to be used.

(b) The plot of the mix blend gradation on the Federal Highway Administration (FHWA) 0.45 power gradation chart.

(c) The mix properties related to the design parameters given in Table A-1.

TABLE A-1
SMA MIX PROPERTIES

Design Parameters	Specified Value/Range
Voids (%)	4.0 ± 0.5
Asphalt Content (%)	See 4.4, Table A-4
VMA	17.0 min.
Marshall Stability, N	7000 min.
Marshall Flow, 0.25 mm (0.01 inch)	8-16
Voids in Coarse Aggregate (VCA_{mix}) (%)	< VCA_{DRC}
Draindown at Production Temp. (%)	0.30 max.
TSR %, @ 6.0% ± 1.0% air voids	70% min.

33.04.2 Fine and Coarse Aggregates

(a) Coarse Aggregate. Coarse aggregate shall be crushed stone and unless otherwise stipulated, shall conform to the quality requirements of Table A-2.

TABLE A-2

SMA AGGREGATE REQUIREMENTS

ACCEPTABLE COARSE AGGREGATE (S)	ACEPTABLE FINE AGGREGATE (S)
Trap Rock, Dolomitic Sand Stone, Meta-Arkose, Diabase or Andesite from approved source on MTO DSM	Manufactured from Trap Rock, Dolomitic, Sandstone, Meta-Arkose, Diabase or Andesite

Mixes with relatively pure carbonate aggregates or any aggregates known to polish shall not be used.

(b) Fine Aggregate. Fine aggregate shall consist of a blend of 100% crushed, manufactured sand. It shall conform to the quality requirements of Table A-2. The sodium sulfate soundness loss in 5 cycles shall not exceed 15 percent. In addition, the liquid limit shall not exceed 25 as determined by AASHTO T 89.

33.04.3 Blended Aggregate Gradation

The blended aggregate gradation specification, based on volume, is given in Table A-3. SMA mixes may have aggregates with significantly different bulk specific gravities and for this reason, gradation based on volume is applicable. If the bulk specific gravities of the aggregates vary by 0.02, or less, then gradations based on mass may be used.

TABLE A-3

SPECIFIED SMA GRADATION LIMITS BY VOLUME OF BLENDED AGGREGATE

Sieve Designation	Percent Passing by Volume	
	Lower Limit	Upper Limit
19.0 mm	100	100
13.2 mm	91	100
9.5 mm	50	85
4.75 mm	20	40
2.36 mm	16	28
1.18 mm	--	--
600 µm	--	--
300 µm	--	--
75 µm	8	11

33.04.4 Minimum Asphalt Cement Content

The minimum asphalt content is based on volume of asphalt as a percentage of the aggregate volume and therefore changes as the bulk specific gravity of the aggregate blend changes. The minimum asphalt binder content shall meet the requirements of Table A-4.

TABLE A-4

MINIMUM ASPHALT CONTENT REQUIREMENTS FOR BLENDED AGGREGATES WITH VARYING BULK SPECIFIC GRAVITIES

BULK SPECIFIC GRAVITY OFAGGREGATE BLEND	MINIMUM ASPHALT CONTENT, %
2.40	6.8
2.45	6.7
2.50	6.6
2.55	6.5
2.60	6.3
2.65	6.2
2.70	6.1
2.75	6.0
2.80	5.9
2.85	5.8
2.90	5.7
2.95	5.6
3.00	5.5

33.04.5 Asphalt Cement

(a) Asphalt cement shall be PG 64-28 unless otherwise specified in the contract.

(b) Asphalt cement shall be mixed at a temperature as required to achieve a viscosity of 170 ± 20 centistokes. The plant mixing temperature for SMA shall not exceed 177^{o}C.

33.04.6 Mineral Filler

(a) Mineral filler should consist of finely divided mineral matter such as limestone dust, lime, or flyash. At the time of use it should be sufficiently dry to flow freely and essentially free from agglomerations. Filler should be free from organic impurities and have a plasticity index not greater than 4. Filler material for the mix shall meet the requirements of AASHTO MP8-00.

(b) Mineral filler added to the SMA mixture shall be limited to less than 20% of its weight smaller in size than 20 µm.

33.04.7 Stabilizer Additive

(a) fiber stabilizer, either cellulose or mineral fiber, is to be utilized. The dosage rate for cellulose is 0.3% by mass of the total mix, and for mineral fiber it is 0.4% by weight of total mix. Allowable tolerances of fiber dosage shall be ± 10% of the required fiber weight. The selected fiber should meet the properties in Table 4 of AASHTO MP8-00.

33.04.8 SMA Mix Production

Hot mix asphalt plants used for the production of the SMA mixture shall meet the following requirements:

(a) Handling Mineral Filler. Adequate dry storage shall be provided for the mineral filler, and provisions shall be made for proportioning the filler into the mixture uniformly and in the desired quantities. Mineral filler in a batch plant shall be added directly into the weigh hopper. In a drum plant mineral filler shall be added directly into the drum mixer. Special attention is directed to providing appropriate equipment for accurately proportioning the relative large amounts of mineral filler required for an SMA mixture.

(b) Fiber Addition. Adequate dry storage shall be provided for the fiber additive, and provisions shall be made for proportioning fiber into the mixture uniformly and in the desired quantities.

Batch Plant. Fiber shall be added into the weigh hopper above the pugmill. The addition of fiber should be timed to occur during the hot aggregate charging of the hopper. Adequate dry mixing time is required to ensure proper blending of the aggregate and fiber stabilizer. Dry mixing time shall be increased 5 to 15 seconds above the mixing times for conventional hot mix asphalt. Wet mixing time shall be increased at least 5 seconds for cellulose fibers, and up to 5 seconds for mineral fibers, to ensure adequate blending with the asphalt cement.

Drum Mix Plant. In a drum mix plant fiber shall be added into the drum mixer to ensure complete blending of the fiber into the mix. For this purpose, when adding loose fiber, a separate fiber feeding system shall be utilized that can accurately and uniformly introduce fiber into the drum at such a rate as not to limit the normal production of mix through the drum. At no time shall there be any evidence of fiber in the baghouse or returned/wasted baghouse fines.

(c) Hot-Mixture Storage. When the hot mixture is not to be hauled immediately to the project and placed, suitable bins shall be provided. Such bins shall be either surge bins to balance production capacity with hauling and placing capacity or storage bins which are heated and insulated and which have a controlled atmosphere around the mixture. In no case shall the SMA mixture be kept in storage in excess of 4 hours.

33.05 Mix Transportation

Haul times for SMA should be as short as possible. The SMA mix temperature shall not be raised to facilitate a longer haul time.

Hauling equipment should be of a type normally used for the transport of hot mix asphalt. Truck beds shall be covered and insulated if necessary, so that the mixture may be delivered on the road at the specified temperature. Truck beds should be cleaned with an approved release agent on a regular basis to avoid a build-up of fiber rich mortar. Diesel fuel shall not be used as a release agent.

33.06 Mix Temperatures For Placing, Finishing, And Opening To Traffic

The SMA mixture, when delivered to the jobsite, shall have a temperature of between 140^{o}C and 160^{o}C. The mixture temperature shall be measured in the truck just prior to unloading into the asphalt spreader.

Mix temperatures in the SMA mat should be continuously monitored to assess the rate of temperature dissipation under ambient conditions. Rolling operations should be completed prior to the in-place asphalt mat temperature falling below 120^{o}C.

Traffic should not be placed on the newly compacted surface, until the mat has cooled to 50^{o}C or lower.

33.07 Compaction

(a) SMA mixtures shall be rolled immediately following placement by the spreader. Rolling shall be accomplished with steel wheel rollers of a minimum weight of 9 tonnes (10 tons). The steel drum rollers shall be operated in the non-vibratory mode. Pneumatic tire rollers shall not be used on SMA. Rolling procedures should be adjusted to provide the specified pavement density.

(b) The SMA mix shall be compacted to at least 93% of the JMF Maximum Relative Density (MRD).

(c) Compaction quality control testing during paving should be completed with a nuclear moisture/density gauge that is calibrated for the coarse surface texture of the SMA mix. The calibration should be completed at the time of the test batch and trial paving section and relate nuclear density readings to core densities. An average of at least 5 core and nuclear density determinations shall be completed on the test batch to establish the average correction to be applied to the nuclear density readings.

33.08 Test Batch And Trial Paving Sections

A test batch and trial paving section shall be completed prior to contract paving. This will facilitate the assessment of the mixing plant process control, placement procedures, SMA surface appearance, compaction patterns, and calibration of the nuclear density gauge.

The test batch should consist of at least 50 tonnes of SMA placed in one full width pass with an asphalt spreader. The trial paving section should include the use of steel drum rollers of the type to be used for contract paving. The location of the test batch shall be agreed upon between the Owner and the contractor.

33.09 Quality Control Sampling And Testing

All provisions for quality control sampling and testing as outlined in the main specification document shall apply to SMA paving projects.

B34 - Tactile Warning Surfaces

The provisions of OPSS 351 shall apply as amended or extended herein.

Plate dimension shall conform to OPSD 310.039. Suppliers include Neenah Foundry Company, Neenah Wisconsin, EJ or approved equal by the Owner. The cast iron detectable warning tiles shall be of uniform quality, free from surface defects and shall be provided with an untreated, natural surface finish as directed by the Contract Administrator. The Contractor shall provide shop drawings and installation layout details (radius and tangent plate layout) for each radius for approval by the Contract Administrator.

The detectable warning system shall be installed in fresh concrete flush with the adjacent sidewalk resulting in a snug fit between tiles to limit water infiltration around the perimeter of the system and between tiles, as directed by the Contract Administrator and installation procedures shall be according to the manufacturer's specifications.

Payment of detectable warning plates shall be by the plate of 610mm width acceptably installed to the specified conditions as measured on site by the Contract Administrator. Payment shall be broken down into straight plates and curved plates as applicable.

Payment at the contract price shall be full compensation for supplying all equipment, labour and materials for the installation of cast iron tiles and all other items of work necessary to complete this item in accordance with the contract requirements.

B35 - Disposal Of Excavated Contaminated Soils

The provisions of OPSS 180 and Special Provisions – General, G11 shall apply as amended or extended herein.

If the Geotechnical Investigation Report indicates that the Contractor may encounter soils with elevated Sodium Absorption Ration (SAR) and Electric Conductivity (EC) values during construction with no evidence of any other contaminates then the reuse of such soil is considered permissible for backfill within the project limits. The Contractor is advised that under the unit price bid for different items, the Contractor will dispose of all excess excavated materials within a site that can accept elevated SAR and EC.

If based on the Geotechnical Investigation Report it is anticipated that the Contractor may encounter some additional contaminated soils that exceeds Table 3 with respect to SAR and EC during construction then the following provisions will apply:

The contractor shall load and transport all excess excavated materials to a disposal site selected by the Contractor and in compliance with Ministry of Environment and Climate Change requirements for the disposal of contaminated soils. The Contractor shall submit written approval from the owner of the disposal site indemnifying the owner of the project against future liabilities. The Contractor shall not change the disposal site without prior written approval from the Contract Administrator.

The Contractor shall give at least three working days advanced notice to the Contract Administrator of dates that excavated materials are scheduled to be transported to the waste disposal facility for disposal.

Notwithstanding other requirements, all vehicles transporting excavated materials off-site for disposal must cover their loads at all times during the trip to minimize odours and to prevent materials being blown out of the truck during transportation.

For excavated materials that are saturated or can potentially have fluid drain during the disposal trip, only trucks that can contain the fluid and prevent it from leaking should be used. The Contractor is responsible for removing and/or cleaning up any material and/or fluid that escapes from the transporting trucks.

The Contractor shall sweep and flush the haul route at the end of each day as required if such roads are made dirty by the Contractor's vehicles, or more frequent as directed by the Contract Administrator to maintain the haul route clean.

If additional suspect contaminated soils, beyond those identified in the geotechnical report, are uncovered during excavation, these materials will be segregated, stored on site using best practices and tested to determine if they are acceptable for disposal at the Contractor's disposal site. The Owner will arrange for a representative from an approved environmental company with experience in supervising the exhumation of contaminated soil to be on-site during excavation of the soil to identify and segregate any suspect soil. Delineation of the suspect wastes for segregation will be based on visual observations by the inspector or environmental representative, supplemented with field instrument measurements as required. No excavated materials that are suspected of contamination shall be used as backfill or be removed off-site before adequate chemical test results are available to confirm the quality of the material as determined by the Engineer.

The Contractor shall assist and cooperate with the inspector to identify and segregate any suspect contaminated soil uncovered during excavation

If required, the Contractor shall arrange for the collection of representative samples from the site and laboratory testing for waste classification tests to

address specific requirements of the Contractor's disposal site, as directed by the Owner's Representative. Laboratory costs shall be paid for by the Owner

Payment for disposal of excavated contaminated material shall be based on tonnage of contaminated material removed from the site based on the weigh tickets received from the disposal site selected by the contractor. Contractor and inspector shall agree on the number of loads that were sent to the receiving site on a daily basis and the corresponding number of weight tickets shall be provided.

Payment for this item is a premium over and above the excavation item. Accordingly, cost for this item should be limited to hauling and tipping fees.

C1 - Sewers

The provisions of OPSS 410 apply except as amended or extended herein.

The work under this item shall include, without limitation, all labour, material and equipment required for the supply and installation of storm and sanitary sewers in the material, sizes and classes as specified herein and to the elevations, grades and locations as detailed on the contract drawings.

All sewers shall be installed in a supported excavation (vertical trench) in accordance with OPSD 802.010, 802.013, 802.014, and 802.020 for flexible pipe and OPSD 802.030, 802.031, 802.032, or 802.033 for rigid pipe. The width of trench shall be approved by the Engineer. The work under this item shall include any form of trench support required. Such trench support, if used, shall be approved by the Ministry of Labour under the Occupational Health and Safety Act and Regulations prior to its use.

All bedding and cover material shall be Granular 'A'. Trench backfill under the travelled portion of the road, sidewalks and driveways shall be Granular 'A' conforming to OPSS 1010 and compacted to 100% S.P.D. unless specified otherwise. Select native material, as approved by the Engineer, shall be used for backfill for all other areas and shall be compacted to 95% S.P.D.

The Contractor shall trace and confirm the location and depth, at the R.O.W. limit, of all existing sanitary laterals for each residence prior to placing the pre-manufactured tee on the proposed sanitary sewer.

All catchbasin leads shall be 250 mm (10") dia. or 300 mm (12") dia. PVC DR-35 at a minimum slope of 0.5% unless specified otherwise.

Upon completion, all sewers shall be flushed and CCTV inspected. Payment for the CCTV inspection and flushing of sewers shall be included under the

appropriate contract item. Should the CCTV inspection reveal a defect in the sewer or either of the deflection tests (flexible sewer pipe only) fail, the Contractor shall be responsible for the repair of the sewer and shall bear the cost of the repair, including all reinstatements, re-testing and a second CCTV inspection. The method of repair shall be approved by the Engineer.

Payment for granular material specified for backfill, cover and bedding shall be included under the appropriate granular item.

Measurement for payment under this item shall be as per OPSS 410.09.01.01. Payment at the tendered unit price shall be full compensation for all related costs.

The following provisions shall apply to flexible or rigid sewer pipes respectively:

Flexible Sewer Pipe

For the purpose of this specification, flexible storm sewer pipe shall be treated in the same way as flexible sanitary sewer pipe. Accordingly, all work shall be carried out in accordance with OPSS 410 and OPSD 802.010.

All flexible sewer pipes, 200 mm (8") dia. and greater, shall be PVC class DR35 (or approved equal) unless specified otherwise. All flexible sewer pipes, less than 200 mm (8") dia., shall be PVC class DR28.

All connections to manholes or other pipes shall be made with Kor'n'Seal adaptors or approved equivalent.

All service and/or catchbasin lead connections to the proposed flexible sewer pipe shall be made with pre-manufactured tees (or as specified on OPSD 1006.020).

The work under this item shall include deflection testing, generally in accordance with OPSS 410.07.16.05. A mandrel or pig, not less than 95% of the base inside diameter (as defined in the CSA or ASTM standard to which the pipe is manufactured), shall be successfully drawn through the flexible sewer pipe installed under this contract. A total of two tests shall be completed; one upon substantial performance and the second at the end of the one year maintenance period. All tests shall be carried out in the presence of the Engineer or his representative.

Rigid Sewer Pipe

The work shall conform to OPSS 410, 514 and 516 and OPSD 802.030 – Class 'B'.

All rigid sewer pipe shall be concrete CL 65-D, Type 50 cement unless specified otherwise.

All connections to manholes shall be affected by use of non-shrink fill in accordance

with OPSD 708.020.

All service and/or catchbasin lead connections to the proposed rigid sewer pipe shall be made with pre-manufactured tees (or as specified on OPSD 1006.010).

C2 - Sewer Laterals

The provisions of OPSS 410 and Special Provision C1 shall apply except as amended or extended herein.

Connections to the sewer shall be made by a proper tee or approved saddle and shall allow for the following:

- Vertical risers, where the angle of the lateral at the main sewer is 30 degrees or more from horizontal.
- Sweep bends for required bends.
- Connections to the existing sewer lateral and/or sewer main are paid for under item C4.

Measurement for payment shall be as per OPSS 410.09.01.02.

C3 - Deleted.

C4 - Reconnect Existing Sewer Laterals

The provisions of OPSS 410 and Special Provisions C1 and C2 apply except as amended or extended herein.

Bedding conforming to OPSD 802.010 shall be used and a watertight connection to the existing lateral is to be made with an approved rubber coupler with stainless steel connecting bands.

The unit price bid for this item shall include the reconnection of the sewer lateral at the main sewer or riser and at the existing sewer lateral with the appropriate couplings and proper sized tee.

The unit price shall also allow for up to two metres of additional sewer piping and suitable size coupling. Additional piping required for the sewer lateral reconnection beyond two metres will be paid under the sewer lateral item.

Measurement for payment under this item shall be for each lateral reconnected.

C5 - Flush and T.V. Inspect Sewers

The provisions of OPSS 409 apply except as amended or extended herein.

Upon completion of installation, the sewer main will be flushed and T.V. inspected. The contractor will be fully responsible for the materials supplied and workmanship; including the supply of two (2) copies of the written reports and two (2) DVD disks after completion of each inspection. The written report shall include a photograph at every service connection.

The basis of payment for this item shall be per metre for mainline sewer inspection and flushing; the TV inspection of sanitary sewer laterals shall be per individual lateral inspected (e.g. each), irrespective of the length, condition or outcome of the lateral inspection.

C6 - Pre-Cast Concrete ManholesCatch Basins and Ditch Inlets

The provisions of OPSS 407 apply except as amended or extended herein.

A minimum clearance of 500 mm shall be provided between the concrete structure and the trench wall to facilitate proper compaction of the specified backfill material.

NOTE: Unless specifically noted in this specification, catchbasins do not require pre-manufactured water tight connections.

A 20 MPa concrete cradle shall be provided from and around the manhole to the first pipe joint of inlet and outlet pipes (OPSD 708.020).

C7 - Cleanouts

The unit price bid shall cover the supply and installation of cleanout units at or near the property line, all as detailed in the municipality's standard drawing, and shall include the cost of all connections to the sanitary sewer laterals and reinstatement of the site.

Cleanout units shall consist of PVC class SDR 28 pipe material and shall be delivered complete of all components such as cap, stem, tee, reducers, couplings etc.

Cleanout caps shall be Crawl type or as manufactured by Duratron Systems Limited or similar approved types.

Cleanouts installed within paved areas shall have caps consisting of flat metal plates with no protruding bolts or nuts and shall be installed flush with the surrounding asphalt or concrete surface. In all other areas caps shall be placed

approximately 50 mm below the ground surface.

Prior to the cleanout installation the Contractor shall submit a sample of the cleanout unit to the Contract Administrator for approval.

D1 - Watermains

The provisions of OPSS 441, the Niagara Peninsula Contract Document – Item D1, D4, D5, D6, and D7 apply, except as amended or extended herein.

All watermain fittings, pipe and fixtures are to be “lead free” and shall comply with NSF/ANSI Standard 61: Drinking Water System Components – Health Effects (2007 as amended). All fittings must be certified as compliant by an industry recognized and accredited third party per the requirements of NSF/ANSI 61.

At the request of the contract administrator, the contractor shall supply manufacturers’ documentation stating their compliance with said standard.

Any pipes, fittings or fixtures installed where documentation of NSF/ANSI 61 compliance is not provided shall be removed and replaced by the contractor at their cost. No additional costs will be entertained for any works associated with the replacement of a non-conforming component.

The work under this item shall include, without limitation, all labour, material and equipment required for the supply and installation of watermains in the material, sizes and classes as specified and to the elevations, grades and locations as detailed on the contract drawings.

All watermains shall be installed in a supported excavation (vertical trench) in accordance with OPSD 802.010, 802.013, 802.030, 802.031, 802.032, 802.033, or 806.060. The width of trench shall be approved by the Engineer. The work under this item shall include any form of trench support required. Such trench support, if used, shall be approved by the Ministry of Labour under the Occupational Health and Safety Act and Regulations prior to its use.

All bedding and initial backfill to 300 mm above the pipe shall be granular material, not greater than 25 mm in size.

All reinstatements to match existing conditions including driveways and sodded areas.

All connections, bends, etc., which cannot be adequately blocked shall be secured utilizing retaining glands and/or tie rods acceptable to the pipe manufacturer and the Contract administrator. The rods shall be protected with an approved bituminous material and waterproof wrapping.

Trench backfill under the travelled portion of the road, sidewalks and driveways shall be granular "A" compacted to 100% standard Proctor density unless otherwise indicated. Select native material will be allowed for all other areas and shall be compacted to 95% standard Proctor density.

Disinfection of watermains shall be conducted in accordance with the most recent AWWA C651 Standard for Disinfecting Watermains, as amended.

The Contractor shall take due precaution during the chlorination testing, charging and flushing of the watermain so as not to cause contamination to the municipalities distribution system. The Contractor shall also take all necessary precautions to prevent freezing of all exposed mains and laterals. The unit price bid shall be deemed to have made due allowance for these requirements.

The Contractor shall notify all business and property owners 48 hours prior to plant disruption and shall ensure that these properties and businesses are inconvenienced as little as possible.

The following shall apply for watermains installed by means of boring and jacking:

- For the installation of watermains 100 mm in diameter or larger, a full bore augering method shall be used rather than a “torpedo” or soil displacement method.

- The size of the bore and the method for pulling the pipe through the bore shall be in accordance with the pipe manufacturers’ specifications. Skids shall be used to support the pipe and prevent it from resting on the bells.

The unit price bid shall be for the complete supply and installation of the watermains with minimum cover as specified on the contract drawings, by the vertical trench open-cut method, and shall include all necessary sheeting, shoring, dewatering, excavation in the trench in all types of soils and disposal of surplus excavated materials, and backfill. The unit price bid shall also allow for the supply and installation of all special pipe sections, reducers, bends, couplings, crosses, tees, fittings, adaptors, concrete thrust blocks, tie rods or retainer glands, connections to the existing mains, and temporary and permanent support of all utilities encountered in the trench

Payment for granular material specified for backfill, cover and/or bedding will be included under the appropriate granular item.

Once a watermain has been disinfected and approved by the contract administrator, it should be connected to the live system within seven (7) calendar days. Should the watermain not be connected within seven (7) calendar days, the watermain shall require re-flushing with source water.

D2 - Valves

OPSS 441 and Special Provision D1 - apply to this item and shall include the following:

- Installation of valve and valve box
- All valves to open left-handed with a 50 mm square operating nut.
- Gate valves shall be either Canada Valve 55, Mueller Limited No. A2360-23, McAvity No. 20075-R or Clow F6100 or per the owner's approved materials list as amended.

The unit price bid shall allow for the supply of new 130 mm I.D. valve boxes and making the final adjustment to the valve boxes.

Measurement for payment will be as per OPSS 441.09.01.02.

D3 - Hydrant Sets

The provisions of OPSS 441, Special Provisions D1 and OPSD 1105.01 apply except as amended or extended herein.

Hydrant valves to open left-handed with a 50 mm nut.

The fire hydrant supplied shall:

- be two piece barrel and stem;
- have two - 2-1/2 inch hose outlets with CSA threads;
- have steamer nozzle with thread Gauge No. 36B (4-13/16 O.D. x 5 T.P.I.);
- The type of hydrant shall be as specified on the Contract Drawings or in the Schedule of Tender Unit Prices, and shall be painted in the Owner's standard colour.

The unit price bid shall allow for a hydrant installation with a standard cover depth of 1.8 m and shall be full compensation for all equipment, labour and materials required to complete the work.

The cost for any extension pieces necessary due to a change in elevation shall be negotiated with the Owner.

Measurement for payment will be as per OPSS 441.09.01.03

D4 - Water Services

The provisions of OPSS 441 and Special Provisions D1 apply except as amended or extended herein.

The unit price bid for this item shall be complete compensation for the supply and installation of a water service with a minimum of 1.5 m depth of cover from the new main stop to the curb stop at the property line. Main stops and curb boxes installed, if required, shall be paid for separately under the appropriate item(s) in the Form of Tender.

The tenderer shall note that all couplings shall be one piece type, Mueller or Cambridge Brass compression type or approved equal.

The unit price bid for this item shall also include the complete supply and installation of service saddles for the mainstop, as shown in OPSD 1104.01 and 1104.02. The saddles shall be stainless steel Cambridge Brass, Robar, Mueller or approved equal.

D5 - Main Stop

OPSS 441, Special Provisions D1 and related Special Provisions apply to this item except as amended or extended herein. The unit price bid for this item shall include the complete supply and installation of new corporation main stops or replacement of existing main stops.

Tenderers shall note that all main stops shall be either Mueller II Ori-seal, Cambridge Sries 301 (Ball Style) or approved equal, utilizing stainless steel service saddle with double stainless steel bolts as noted in OPSD 1104.01 and 1104.02. The quantity of main stops to be paid for will be the number of main stops installed.

Payment shall be full compensation for all equipment, labour and materials required to do the work.

D6 - Curb Stops

OPSS 441, Special Provisions D1 and related Special Provisions apply to this item and shall include the following:

- Installation of new curb stops or the replacement of existing stops. Replacement of curb stops shall include suitable adaptors to re-connect existing services as well as the removal and disposal of surplus material.

The quantity of curb stops to be paid for will be the number of curb stops installed based on field measurements.

Payment shall be full compensation for all equipment, labour and materials required to do the work.

D7 - Curb Box

OPSS 441, Special Provisions D1 and related Special Provisions apply to this item and shall include the following:

- Installation of new curb boxes or the replacement of existing curb boxes.

The curb boxes shall be Mueller A726, Clow #8D1, Bibby VSB1-6 or approved equal.

The quantity of curb boxes to be paid for will be the number of curb boxes installed based on field measurements.

Payment shall be full compensation for all equipment, labour and materials required to do the work

D8 - Reconnect Water Services

(Note: It is recommended to have separate items for varying sizes of water services, where known, in the Form of Tender.)

OPSS 441, Special Provisions D1 and any details indicated on the Contract Drawings, apply to this item and shall include the following:

The Contractor shall reconnect all water services to the new watermain with approved water service pipe. The size of the connecting pipe, coupling, main stop and saddle, must match the existing service. Water services less than 20mm diameter shall be replaced with minimum size of 20mm including all appurtenances.
The unit price shall include all exploratory excavations to determine the location, size, and type of water service, disconnection of existing service, including turning off main stop on abandoned watermain (if required).
The unit price bid shall also allow for up to two metres of additional water service piping and suitable size coupling. Additional piping required for the service reconnection beyond two metres will be paid for under the water service item.

Measurement for payment will be based on the number of water service reconnections undertaken.

D9 - Insulation of Services/Watermain

The unit price bid for this item shall include the insulation of the services/watermain where directed by the Contract Administrator or as shown on the contract drawings.

Where less than the minimum specified cover over services/watermain is to be provided or as otherwise directed by the Contract Administrator, the Contractor shall provide sufficient insulation to prevent freezing of such sections of services or watermain.

Unless otherwise specified, services with less than 1.2 m of cover at any location along the length shall be insulated. The width and thickness of insulation used shall be as specified in the following table.

* Depth of Cover (m)

Depth of Cover	Width of Insulation (m)	Thickness of Insulation (mm)
1.40	1.2	50
1.20	1.2	65
1.05	1.2	75
0.90	1.5	100

* Depth of Cover is the distance from the ground surface to the top of the service/watermain or the distance from a culvert, large storm sewer, unheated chamber, etc., to the closest point on the service/watermain.

The insulation material shall be styrofoam HI 40 as manufactured by the Dow Chemical Company or approved equal. The material shall be rigid type high density board with minimum compressive strength of 240 kPa as tested in accordance with ASTM D1621-64 or latest revision thereof, and manufactured by the extrusion of expanded polystyrene to produce a board with maximum water absorption of 0.7% by volume when tested in accordance with ASTM D2842. When installed underground, the insulation shall be protected on both faces by a layer of 6 mm plywood, unless installed against a formed surface.

The quantity of insulation to be paid for will be the number of square metres based on field measurements of each thickness unless otherwise specified. Square meters shall be the total of both vertical and horizontal faces.

Payment shall be full compensation for all equipment, labour and materials required to do the work

D10 - Cathodic Protection of Watermains & Appurtenances

Cathodic protection is to be provided at fittings, valves, water services and hydrants.

The provisions of OPSS 442 apply except as amended or extended herein.

1. Zinc Anode Specifications

   (a) Zinc anode material shall be made from high grade electrolytic zinc 99.99% pure and conform in composition to ASTM B418-73 Type II. The zinc casting shall be supplied with a minimum 3.1 mm diameter core wire though its length.

   (b) The zinc casting and its backfill shall be contained in a moisture absorbent container such as cardboard tube or jute bag, packed in appropriate, removable shipping bags. The backfill material shall have the following composition by nature:

   Gypsum 77% (±2) Bentonite 15% (±1) Sodium Sulphate 8% (±1).

   The backfill material shall have an electrical resistivity between 40 and 200 ohm-cm when wet.

   (c) The packaged zinc anode shall be supplied with 2.0 m of AWG #10/7 strand copper cable having white TWH insulation.

   (d) Bituminous coating material Tapecoat MC Mastic or approved equal shall be used on all exposed bolts and anode connections.

2. Anode Installation

   (a) The anode shall not be lowered into the trenches by its lead wire.

   (b) The anodes shall be installed in accordance with the detailed drawings provided with this specification.

   (c) The anode shall be placed a minimum distance of 0.5 m from the watermain, water service or other underground utility plant in a horizontal position at approximately the same elevation and parallel to the watermain, water service or hydrant branch.

   (d) At least 300 mm of backfill shall be packed uniformly around the anode to eliminate voids of air pockets adjacent to the anode.

   (e) The anode lead shall be wrapped around the watermain/fitting/valve/ hydrant/water service and knotted prior to connection of anode.

(f) The anode shall be thermite welded to the watermain/fitting/valve/hydrant, using an Erico model CAHAA-1G welder and suitable cartridges (#CA 15 for ductile iron and #XF19 for cast iron) or approved equal. The thermite weld shall be tapped with a hammer to ensure that a strong connection has been accomplished and coated using approved brush applied bituminous coating material.

(g) The anode lead cable shall be connected to copper water services by doubling over the end of the lead cable and utilizing an approved brass or stainless steel band and clamp, properly coated with an approved brush applied bituminous coating material.

3. Anode Bank Installation

(a) The anodes shall not be lowered into the augured hole by its lead wire. The augured hole shall be a minimum 200 mm to a maximum 300 mm diameter and shall be a minimum of 1.8 m in depth to provide a minimum of 300 mm of cover at ground elevation.

(b) The anodes shall be installed in accordance with the detailed drawings provided with this specification and at location as shown on the contract drawings.

(c) The anodes shall be placed a minimum distance of 0.6 m from the watermain, water service or other underground utility plant in a vertical position.

(d) At least 300 mm of backfill shall be packed uniformly around the anode to eliminate voids or air pockets adjacent to the anode.

(e) The anode lead shall be wrapped around the watermain/fitting/valve hydrant/water service and knotted prior to connection.

(f) The anode lead shall be thermite welded to the watermain/fitting/valve/hydrant, using an Erico model CAHAA-1G welder and suitable cartridges (#CA15 for ductile iron and #XF19 for cast iron) or approved equal. The thermite weld shall be tapped with a hammer to ensure that a strong connection has been accomplished and coated using approved brush applied bituminous coating material.

(g) The anode lead cable shall be connected to copper water services by doubling over the end of the lead cable and utilizing an approved brass or stainless steel band and clamp, properly coated with an approved brush applied bituminous coating material.

(h) Where the anode lead cable is required to cross the road or

driveways to make the necessary connections, it shall be bored.

D11 - Abandon Old Watermains

OPSS 441, Special Provisions D1 and related Special Provisions - apply to this item and shall include the following:
The Contractor shall abandon the old watermain after the new watermain is in service and all water services have been connected to it. This work shall include sawcutting, excavating and removal of any surplus material as per Special Provisions General - Item in order to carry out the following works:

(a) Where the abandoned watermain is disconnected from an in-service watermain, the abandoned connection at the in-service watermain shall be properly repaired. If the connection was by means of a cross, the abandoned leg of the cross shall be plugged with an approved mechanically restrained cap and a thrust block. If the connection was by means of a tee, the tee shall be removed and the in-service watermain repaired with an appropriate size closure pipe with approved sleeves. The unit price bid shall include all necessary caps, closure pieces, sleeves, mechanical restraints and thrust blocks as necessary.

(b) Where only the removal of the valve box is required on the abandoned watermain, the valve shall be closed before the valve box is removed. The valve box shall be returned to the municipality.

(c) All fire hydrant assemblies, including branch valves and valve boxes connected to the abandoned watermains, shall be removed and returned to the municipality. The end of the pipe remaining in the ground shall be sealed with concrete and the costs for this item shall be included under this item.

(d) Where the old watermain is abandoned and no longer connected to an existing watermain, the end of the pipe remaining in the ground shall be sealed with concrete.

Measurement for payment will be based on field measurements for each plug installed, valve or valve box removed or fire hydrant assembly removed or each sealed pipe as outlined in items (a), (b) (c) and (d) above.

Payment shall be full compensation for all equipment, labour and materials required to do the work.

D12 - Temporary Water Supplies

The provisions of OPSS 493 and Special Provisions D1 apply except as amended or extended herein.

Contractor's tender price shall include for the provision of temporary water supplies to all premises affected whenever such water supplies are interrupted, cut off, or turned off by the Contractor during the course of the work.

Temporary water lines shall be chlorinated, protected and removed upon completion of the work.

It will be the responsibility of the Contractor to notify one day in advance all water users who will be affected by shutting off the water supply.

The Contractor shall be solely responsible for all damages and claims that may result from inadequate water supplies or failure to give proper notice to all water users in the area.

D13 - Watermain Disinfection and Testing

The provisions of OPSS 441 shall apply except as amended or extended herein.

Connection to an Existing Distribution System

For a new watermain installation, the “source” connection to the existing distribution system shall only be made with a new tapping sleeve and valve or cut-in tee and valve. A new main shall not be pressure tested against an existing valve. All pipe sections and associated fittings associated with the final connections and tie-ins shall be spray disinfected or swabbed with a 1-5% solution of chlorine. The source valve shall only be operated by the Owner, unless otherwise approved.

Testing and Acceptance of Watermains

Prior to the commencement of any watermain construction, the Contractor shall submit a chlorine residual and bacteriological test sampling plan to the Owner for approval. This plan shall detail the source water locations, the final connection locations and the sampling locations. The Contractor shall allow 2 weeks for approval. Appropriate coding or labelling must be provided on the plan to clearly collate the sample results to the sampling locations. All samples shall be taken by the Owner or his designate. Samples shall only be taken between the hours of 8:00 a.m. and 2:30 p.m., Monday to Friday, unless otherwise approved by the Owner. The Contractor shall be responsible for the scheduling of all samples and shall provide the Owner at least 24 h notice.

In order for a watermain to be considered for acceptance by the Owner, the following procedures and tests must be successfully completed in the presence of the Contract Administrator. A "Disinfection and Testing Checklist", similar in form shall be prepared for each sample location. All checklists shall be maintained on-site and available for review.

Swabbing

Prior to disinfection, all sections of watermain shall be swabbed using a minimum of four new foam swabs. Swabs shall be polyurethane with a density of 24.7 kg/m^3, have a minimum diameter 50 mm larger than the inside diameter of the watermain and have a minimum length of one and one half times its diameter. The Contractor shall mark, number and demonstrate to the Contract Administrator that all swabs, or parts thereof, have been retrieved.

Hydrostatic Testing

Hydrostatic pressure testing shall be in accordance with OPSS 441.

Chlorination for Disinfection

Upon successful completion of the hydrostatic testing for the new watermain, the main shall be flushed with source water. After flushing is complete, source water shall be allowed to flow, at a controlled rate, into the new main. Liquid chlorine shall be applied so that the chlorine solution is a minimum of 50 mg/L throughout the entire section.

The main shall be left charged with the chlorine solution for a minimum of 24 h. After 24 h, the chlorine residual shall be tested If the chlorine residual is less than 25 mg/L, the chlorination procedure shall be repeated. If the chlorine residual is greater than 25 mg/L, the main shall be flushed with source water to clear the chlorinated water. Prior to disposal into the environment, an approved neutralizing chemical shall be applied to all chlorinated water used for disinfecting, testing or flushing.

Bacteriological Testing

Upon successful completion of the chlorination procedure, the main shall be flushed and recharged with source water until the chlorine residual is equal to that of the source water or between 0.2 mg/L and 4 mg/L. The main shall be left charged for a minimum of 24 h. After 24 h, samples will be taken for bacteriological testing. The main is not to be flushed prior to taking these samples. Chlorine residuals may also be taken at this time, however they are not necessary.

Samples for bacteriological testing shall be taken from points every 350 m along the new main, including one sample at each end of the new main and every branch greater than 6 m in length.

If the bacteriological tests indicate contamination, the entire chlorination procedure shall be repeated. If the tests pass, prior to reconnecting any services, the chlorine residual shall be checked and, if required, the new main shall be flushed with source water again to establish a chlorine residual greater than 0.2 mg/L.

Disinfection and Testing Checklist

A disinfection and testing checklist, similar to the following, shall be completed for each sample location. The sample plan and all checklists shall be maintained on-site and available for review.

NEW WATERMAIN DISINFECTION AND TESTING CHECKLIST				
Project Name:			**Project Number:**	
Contractor:			**Site Supervisor:**	
Contract Administrator:			**Construction Inspector:**	
SAMPLE LOCATION:				
Procedure Step	**Approval Date**	**Contractor's Signature**	**Contract Administrator's Signature**	**Results / Comments**
1. Sampling Plan (Attached)				
2. Swabbing				

3. Hydrostatic Pressure Test				
4. Chlorine Residual (Initial)				
5. Chlorine Residual (24-Hour)				
6. Chlorine Residual (Post Flushing)				
7. Bacteriological Test (Sample Taken)				
8. Bacteriological Test (Result Received)				

Payment shall be full compensation for all equipment, labour and material necessary to provide the required sample locations including the installation and removal of any temporary valves, blow-offs and services.

Measurement for payment will be lump sum and include all sampling taken on the new main.

D14 - Tracer Wire

This specification covers the requirements for installation of tracer wire on all new non-metallic watermains or forcemains.

The provisions of the latest revisions of OPSS 412, OPSS 441, and Special provisions D1 shall apply except as amended or extended herein.

Tracer wire shall be either 8-gauge, 7 strand copper insulated wire or #10 AWG Solid steel core soft drawn high strength tracer wire as supplied by Copperhead, or approved equal, as specified in the Form of Tender. For directional drilling, auguring or boring installations, tracer wire shall be 12 AWG Solid EHS-CCS Horizontal Directional Drill tracer wire as supplied by Copperhead, or approved equal.

Install electrically continuous trace wire on all water mains, force mains, hydrant laterals and service laterals except where such pipe is of copper material. The wire shall be installed in such a manner as to be easily accessible and able to properly trace all water mains, force mains, hydrant laterals and services without loss or deterioration of signal or without the transmitted signal migrating off of the tracer wire.

All tracer wire welds shall be made to ensure zero pull-out and must be completely sealed using a mastic sealer specifically manufactured for underground use (T.C. Mastic or reviewed equal). The mastic sealer must be applied in a thick coat (min. 12m thick) and shall be protected from contamination by backfill material with the use of a plastic membrane.

Tracer wire shall be installed in the same trench and inside bored holes and casings during pipe installation. It shall be secured to the top of the pipe for its entire length and strapped to the pipe at a minimum of 3 meter intervals. The wire shall be extended and made continuous and brought to the surface at each hydrant, valve box, or tracer wire test station in accordance with the standard detail provided by the owner.

Tracer wire shall be installed in the same trench and inside bored holes and casings during pipe installation. It shall be secured to the top of the pipe for its entire length and strapped to the pipe at a minimum of 3 meter intervals. The wire shall be extended and made continuous and brought to the surface at each hydrant, valve box or tracer wire test station in accordance with the standard detail provided by the owner.

All spliced or repaired wire connections in the tracer wire shall be made using a number 37 Marr Wire Connector and made watertight using an approved buried service wire enclosure.

At all water main end caps, a minimum, of 2 meters of tracer wire shall be extended beyond the end of the pipe, coiled and secured for future connections.

For directional drilling, auguring or boring installations, three separate lengths of tracer wire shall be installed with the pipe and connected to the direct buried tracer wire at both ends, or cad welded to the existing iron pipe at both ends.

Prior to the final connection of the watermain/forcemain to the existing system, the Contractor shall carryout a continuity test of the tracer wire and submit the test results. Contractor shall hire a certified Damage Prevention Technician (DPT) to perform the continuity test on all tracer wire access locations in the presence of the Engineer or the Engineers' designate. The results of this continuity test are to be documented using the following form and submitted to the Contract Administrator. If the tracer wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of wire.

No separate payment shall be made to meet the requirements of this specification. Costs are to be included as part of the appropriate pipe item in the Schedule of Tender Prices.

TRACER WIRE INSPECTION SHEET

Project Name and Contract No.: _____

Damage Prevention Technician Name:

_____

Company: _____

Telephone Number: _____

Date: _____

Are you certified by the Ontario Regional Common Ground Alliance as a Damage Prevention Technician (DPT)?

❑ Yes ❑ No

Date of DPT Certification: _____

Tracer Wire Test Station #	UTM Northing Location	UTM Easting Location	Continuity Test Results
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑

			Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail
			❑ Pass ❑ Fail

Damage Prevention Technician Signature

_____

D15 - PETROLATUM TAPE CORROSION PROTECTION

The provisions of the latest revisions of OPSS 442 and AWWA C217 shall apply except as amended or extended herein.

Petrolatum Tape Systems shall be applied in three (3) parts comprising of a Primer, Profiling Mastic, and Petrolatum Tape for low temperature application. The supplied system shall meet International Organization for Standardization 9001 (ISO 9001 Standards), and, prior to application, the contractor shall provide proof to the contract administrator that the supplied system meets this standard.

The Petrolatum Tape System is to be applied on all direct buried metallic pipes, valves, fittings, and appurtenances.

Application of the Petrolatum Tape System will be in accordance with the manufacturer's recommendations and specifications. The contractor is to ensure that all persons installing the petrolatum tape receive proper training, and obtain certification, from the manufacturer.

Payment at the lump sum contract price for the above tender items shall be full compensation for all labour, equipment, and material to do the work.

D16 - CHAMBERS

The provisions of the latest revisions of OPSS 407, OPSS.MUNI 441, and Special Provisions C6 and D2 shall apply except as amended or extended herein.

The work under this item shall be for the installation of an operational valve/meter chamber as indicated on the contract drawings up to a minimum of 1000mm outside of the chamber, or to the limits indicated on the contract drawings, including all: precast concrete chambers, valves, meters, fittings, restraints, couplings, seals, piping, supports, waterproofing, thrust restraint, steps, ladders, and all other appurtenances as indicated.

No products shall be supplied to site prior to the engineer returning reviewed shop drawings.

All concrete chambers will be constructed using sulphate resistant cement (i.e. Type HS).

All piping, fittings and equipment are to have flanged connections unless otherwise indicated on the contract drawings. Piping and fittings shall be of material and class indicated on the contract drawings unless otherwise specified herein.

Tracer wire shall not be installed through the chamber and must be placed around the outside ensuring continuity.

All materials coming in contact with potable water must meet AWWA and NSF 60/61 standards. Verification of compliance to these standards must be provided to the contract administrator.

Payment shall be full compensation for all labour, equipment, and material required to do the work to the limits indicated on the contract drawings.