

**SPECIAL PROVISIONS – CONTRACT ITEMS SUPPLEMENTARY**

**I N D E X**

<b>DESCRIPTION</b>	<b>PAGE</b>
<b>A4. CONSTRUCTION LAYOUT .....</b>	<b>SPCS-1</b>
<b>A5. CLEARING AND GRUBBING .....</b>	<b>SPCS-1</b>
<b>A7. INSTALL, MAINTAIN AND REMOVE SILT CONTROL DEVICES .....</b>	<b>SPCS-2</b>
<b>A8 CONSTRUCTION SIGNS, TRAFFIC CONTROL &amp; TRAFFIC MANAGEMENT PLAN .....</b>	<b>SPCS-2</b>
<b>A9 CONTINGENCY ALLOWANCE .....</b>	<b>SPCS-4</b>
<b>A10. CONSTRUCTION SCHEDULE .....</b>	<b>SPCS-4</b>
<b>A11. FISH SALVAGE AND TRANSFER .....</b>	<b>SPCS-5</b>
<b>B2. EXCAVATION .....</b>	<b>SPCS-6</b>
<b>B3. GRANULAR MATERIAL .....</b>	<b>SPCS-7</b>
<b>B6. SUBDRAIN .....</b>	<b>SPCS-9</b>
<b>B14. SUPPLY AND PLACE HOT MIX ASPHALT .....</b>	<b>SPCS-9</b>
<b>B19. REGRADING OF DITCHES AND SWALES .....</b>	<b>SPCS-10</b>
<b>B22. TOPSOIL, SEED AND MULCH .....</b>	<b>SPCS-11</b>
<b>B27. REMOVAL OF EXISTING ITEMS .....</b>	<b>SPCS-12</b>
<b>B36. STEEL BEAM GUIDE RAIL AND POSTS .....</b>	<b>SPCS-13</b>
<b>B37. ENERGY ATTENUATING SYSTEM - MASH SOFTSTOP TERMINAL SYSTEM .....</b>	<b>SPCS-14</b>
<b>F1. CONCRETE IN SUBSTRUCTURE .....</b>	<b>SPCS-14</b>
<b>F2. WATERWAY PROTECTION AND DEWATERING .....</b>	<b>SPCS-15</b>
<b>F3. STAINLESS REINFORCING STEEL .....</b>	<b>SPCS-17</b>
<b>F4. DOWELS INTO CONCRETE .....</b>	<b>SPCS-17</b>
<b>F5. RETAINING WALLS WITH TIEBACKS .....</b>	<b>SPCS-18</b>
<b>F6. GEOTEXTILE .....</b>	<b>SPCS-27</b>
<b>F7. RIVER STONE – R10 .....</b>	<b>SPCS-27</b>
<b>F8. RIP-RAP – R50 .....</b>	<b>SPCS-28</b>
<b>F9. UTILITY ALLOWANCE .....</b>	<b>SPCS-28</b>

#### **A4. CONSTRUCTION LAYOUT**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, the following shall also apply:

The Contractor shall survey and record grades and centreline of existing roadway. The new roadway grades and centreline are to match existing conditions.

The Contractor shall include in the lump sum cost for this item the costs to undertake all layout, including, but not limited to: setting screed elevations, the checking of all grades and alignment with the use of batter boards and boning rods or digital survey equipment to ensure proper adherence to design, re-staking of layout lost due to destruction or removals and any additional layout within the intent of the contract for minor revisions to the road, sidewalk, or utility designs, et cetera.

An absolute minimum of 3 layout stakes shall be provided for any single line of layout. Maximum spacing of grade stakes shall be 15 metres for all layout and at all changes of grade and/or direction.

Failure to comply with the above conditions will result in a reduction in payment to this item.

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

#### **A5. CLEARING AND GRUBBING**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 201, the following shall also apply:

This item shall include the complete removal and disposal of all trees, vegetation, and shrubs, including stumps, as specified on the contract drawings or as directed by the Contract Administrator. All stumps shall be removed to 300mm below finished grade or, in the case where existing tree roots may interfere with the installation of works in the contract, remove the entire stump and dispose of off-site.

Small trees, stumps and brush within the road alignment, new structure construction alignment, including the channel working area, are to be cleared and grubbed.

Special Provision A5 is amended as follows:

DELETE - Measurement for payment shall be as per OPSS 201.09.01.01.02

and ADD - Basis of Payment:

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

#### **A7. INSTALL, MAINTAIN AND REMOVE SILT CONTROL DEVICES**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 805, the following shall also apply:

The work under this item shall include the supply, installation and maintenance of a Light Duty Silt Fence Barrier, as per OPSD 219.110, at the following locations:

- At the water's edge within the construction limits.
- As required to prevent muddy water, silt or debris from entering the waterway.

The silt fence shall be installed to prevent the release of sediment and debris to the water body during the excavation, removals and grading processes.

The Contractor shall place additional erosion protection as directed by the Contract Administrator or the Niagara Peninsula Conservation Authority.

Payment at the Contract price shall be payment in full for all labour, equipment and materials necessary to complete the work.

#### **A8 CONSTRUCTION SIGNS, TRAFFIC CONTROL & TRAFFIC MANAGEMENT PLAN**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, GC7.06 and OPSS MUNI 706, the following shall also apply:

Interference with normal flow of traffic shall be kept to a minimum. The Contractor shall be prepared to supply and erect any barricades and signs which may be required for complete control of both pedestrian and vehicular traffic including competent flag persons in accordance with Ontario Manual of Uniform Traffic Control Devices. The Contractor shall further provide a **Traffic Control and Management Plan** in accordance with the most recent amendments to the Occupational Health and Safety Act (OHSA). The lump sum price shall be deemed to have included this provision.

The Contractor shall also be responsible for supplying their hired help with any necessary safety and/or protective equipment required to perform the work safely.

**Chippawa Parkway within the project limits will be closed to traffic for the duration of the project.** It will be the Contractor's responsibility to propose and maintain traffic detours to accommodate the road closures including the supply, installation and removal of signage as well as daily review and maintenance of the same.

### Signage

The traffic control signage requirements shall include the following:

Supply, locate, erect, operate maintain, relocate as necessary and remove all necessary traffic signs, construction signs, including delineators, barricades and flashing lights, in accordance with the Ontario Traffic Manual (OTM) Book 7, the latest edition of the "Traffic Control Manual for Roadway Work Operations – Field Edition", and OPSS MUNI 706.

The Contractor is responsible for the installation, daily maintenance and removal of all construction signage throughout the contract.

Regulatory signs and Street Name signs cannot be removed without approval of the City.

Any existing signs removed by the Contractor to accommodate construction shall be kept operational by placement on a temporary support.

All regulatory signs and street name signs will be replaced permanently by City forces with the cooperation of the Contractor.

### Communications

The Contractor will be responsible to keep residents informed of potential disruption to their driveway access and or any additional potential impacts as related to the construction activities.

The Contractor shall advise the Police Department, Fire Department and Niagara Emergency Medical Service on a daily basis, with current status of the construction as it pertains to the passage of traffic within the contract limits.

### Winter Maintenance

Where applicable, the Contractor will be responsible for winter control maintenance in compliance with Provincial minimum maintenance standards for snow clearing, storage and removal, salting and sanding activities within the construction work zone during the course of the contract. All unit prices bid will be deemed to have included allowance for these provisions.

### Basis of Payment

In addition to the payment provisions noted in the Niagara Peninsula Standard Contract Document, the final ten percent (10%) of the lump sum price bid for this item will be held until project completion. The lump sum price bid shall be deemed to include full compensation for all the provisions noted herein.

## **A9 CONTINGENCY ALLOWANCE**

The Contractor shall include in their tender the indicated contingency allowance in the Form of Tender.

### Basis of Payment

Payment for this item will only be made for additional work approved in writing by the Contract Administrator. Work completed before receipt of written approval will not be compensated.

## **A10. CONSTRUCTION SCHEDULE**

In Addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, the following shall also apply:

The Contractor shall provide to the Contract Administrator, before work commences, a detailed Construction Schedule listing work items and the proposed progression of work.

'Milestone Dates' for the completion of each schedule work item shall be clearly indicated. The Construction Schedule shall indicate the critical path, and critical tasks shall be uniquely distinguished from other tasks.

The start of construction is expected, but not guaranteed, on **October 19, 2020**.

**All work must be completed, and the roadway opened to normal traffic, by December 18, 2020.**

No in-water work shall occur from March 1 to July 1 of any year.

The Construction Schedule shall be in the form of a bar chart indicating the starting date and completion date of work items. At a minimum, the following items shall be included in the Construction Schedule:

- Mobilisation.
- Removal of asphalt/surface treatment.
- Waterway protection.
- Excavation.
- Concrete removals, removal of gabion baskets.
- Concrete repairs/Concrete in apron/cut-off walls.
- Install Maccaferri Terrawall (or approved equal).
- Structure backfill.

- Install steel beam guide rail and extruders.
- Asphalt paving.
- Site Restoration.
- Demobilisation.

The Contractor shall take into account and make accommodation for any seasonal requirements for all work within the proposed schedule.

The Construction Schedule shall be updated by the Contractor bi-weekly, or when dates change, or as requested by the Contract Administrator. The Corporation shall be advised of any changes that are required and the reasons for the proposed changes.

#### Basis of Payment

The Contractor will be allowed to invoice fifty-per-cent of the lump sum price once the Construction Schedule is submitted. The remaining balance will be paid once the traffic barriers have been removed and the roadway is opened to traffic.

#### **A11. FISH SALVAGE AND TRANSFER**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, the following shall also apply

The work of this item shall include the following:

- Retaining a biologist or environmental technician qualified to collect and transfer fish, satisfactory to the Ministry of Natural Resources and Forestry.
- Obtaining a License to Collect Fish for Scientific Purpose from the Ministry of Natural Resources and Forestry.
- Performing fish salvage and transfer operations as required during the construction period.
- Identifying and reporting as per Ministry of Natural Resources and Forestry requirements.

After award of contract, the Contractor shall apply for and obtain a License to Collect Fish for Scientific Purpose. A copy of the application shall be submitted to the Contract Administrator. No on-site work shall commence until the permit has been issued by the Ministry of Natural Resources and Forestry, and a copy is received by the Contract Administrator.

#### Basis of Payment

Payment at the lump sum price bid for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

## **B2. EXCAVATION**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS MUNI 206, OPSS MUNI 510, and OPSS MUNI 902, the following shall also apply:

### a) Removal of Asphalt Pavement - Full Depth

The Contractor shall remove and dispose of offsite, the existing roadway asphalt and/or surface treatment on the approaches, to areas outlined on the drawings.

The thickness of the asphalt/surface treatment on the approaches was identified to be approximately 75mm.

The work of this item shall also include partial depth asphalt/surface treatment removal to 40mm in one metre (1m) wide strips across the width of the existing roadway at the extents of these areas to accommodate a flush joint of the new-existing road surfaces. As shown on the contract drawings.

The unit price bid for these items shall include sawcutting, excavating, separating and delivering any asphalt/surface treatment material to an approved recycling facility.

No additional compensation will be made for the removal of various depths of existing asphalt/surface treatment.

All asphalt/surface treatment is to be sawcut. Sawcut limits shall be as shown on the construction drawings or as directed by the Contract Administrator.

### b) Excavation and Grading

The work of this item shall include:

- Excavation for removals and new Terrawall.
- Excavation and grading for roadway.
- Excavation, grading, and disposal of all surplus material of whatever nature in accordance with the General Requirements.

**During excavation, the Contractor shall take due precautions to protect the existing soil-steel structure. Any component of the existing structure 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.

Materials excavated under this item shall be disposed of offsite by the Contractor at an approved landfill site, in accordance with the General Requirements. When hauling rubble, excavated materials or fill from or to the site, the Contractor shall comply with requirements of the Highway Traffic Act.

No granular materials shall be placed on the sub-grade until the sub-grade has been checked and approved by the Soils Engineer and/or Contract Administrator.

The Contractor shall ensure that the excavations are kept dry and make the necessary arrangements for installing pumps and discharge points, if necessary.

All as shown on the Contract Drawings.

**Appendix 902-B, November 2010 is invoked by the Owner for the work under this item.**

Earth excavation for re-grading ditches and swales will not be paid for under this item, and shall be included under the respective items.

#### Basis of Payment

Payment at the unit prices bid for this item shall include all labour, materials and equipment including sawcutting, and disposal of surplus or unsuitable excavated materials, necessary to complete the work as noted on the contract drawings or as directed by the Contract Administrator.

### **B3. GRANULAR MATERIAL**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS MUNI 314, and OPSS MUNI 902, the following shall also apply:

#### a) Granular 'A'

The work of this item shall include supply and placing virgin Granular 'A' material for the following:

- 150mm roadway base, compacted to 100% SPMDD.
- 150mm granular levelling layer below Terrawall, compacted to 100% SPMDD.
- There shall be no compaction on the first 600mm of backfill against and over the existing structure.



Weigh tickets received after the monthly Progress Payment has been finalized, for deliveries made within that month's Progress Payment period **will NOT be accepted.**

b) Granular 'B' – Type II

The work of this item shall include supply and placing Granular 'B' material for the following:

- Minimum 350mm roadway base for roadway over existing culvert, compacted to 98% SPMDD.
- Structure and Terrawall backfill, compacted to 98% SPMDD, as shown on the contract drawings.
- There shall be no compaction on the first 600mm of backfill against and over the existing structure.

c) Granular 'M'

The work of this item shall include supply and placing Granular 'M' material for the following:

- Roadway shoulders at 150mm thickness.

**Appendix 902-B, November 2010 is invoked by the Owner for the work under this item.**

Recycled materials, specifically Recycled Concrete (RCM) and Asphalt (RAP) **will NOT** be permitted on this project.

All as shown on the Contract Drawings.

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

Basis of Payment

Payment for all material quantities shall be determined by net weight as recorded by a Government certified weigh scale. The supplier will be responsible for providing suitable scales for all materials to be weighed. Weigh bills (tickets), shall be provided for each load of granular in accordance with SPGS G32.

The onus shall be on the Contractor to ensure that the City's Inspector is furnished with all weigh tickets on a daily basis, since these will form the method of measurement.

Payment at the unit prices bid for this item shall be full compensation for all labour, equipment and material necessary to complete the work including supply, hauling, placement, grading, and compaction to the specified Proctor Density.

## **B6. SUBDRAIN**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 405, the following shall also apply:

The Contractor shall supply all labour, equipment, and materials required to construct the new subdrain pipe(s) as shown on the contract drawings and as directed by the Contract Administrator.

The work of this item shall include the following:

- Supply and installation of 150 mm diameter perforated high density polyethylene ASTM Class 210 flexible subdrain pipe complete with standard fittings and couplings, as required.
- The 150mm perforated HDPE pipe shall be protected with a knitted sock geotextile conforming to the requirements of OPSS 1860 to prevent the migration of soil particles into the pipe.
- The subdrain with sock will be surrounded in 19mm Clear Stone (Type 2) which together shall be wrapped with a Class I Non-woven Geotextile. This item shall include the supply and installation of the geotextile and Clear Stone.
- The ends of the subdrain shall have 150mm Dia. PVC Sleeve with galvanized rodent traps at all four corners of the structure.
- Supply and installation of solid HDPE pipes or galvanized steel pipes through the Maccaferri Terrawall.

All as shown on the Contract Drawings and as directed by the Contract Administrator.

### Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

## **B14. SUPPLY AND PLACE HOT MIX ASPHALT**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 310, the following shall also apply:

The following Clauses of B14 of the NPSCD are **not applicable** under this contract:

- Clause 14.07.3 Use of Paving Equipment – Paving in Echelon

- Clause 14.07.4 Use of Asphalt Material Transfer Vehicle
- Clause 14.07.5 Use of Re-Heating and Compaction of Longitudinal Joints
- Clause 14.08 Quality Assurance
- Clause 14.09 Price Adjustment Provisions
- Clause 14.10.2 Asphalt Cement Price Adjustment Based on Price Index
- Clause 14.11 Dispute Resolution

All materials shall conform to the requirements of OPSS MUNI 1003 and OPSS MUNI 1150.

The work of this item shall cover the supply and placing of the Tack Coat, HL-8 HS Binder and HL-3 HS Surface Courses as follows:

- Roadway: HL-8 HS 50 mm and HL-3 HS Surface 40 mm

No extra payments shall be made for any handwork involved in spreading or compacting the hot mix asphalt around radii, intersections, trench areas, areas between the existing asphalt and new gutters, curbs, etc.

All as shown on the contract drawings.

#### Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

### **B19. REGRADING OF DITCHES AND SWALES**

The provisions of OPSS MUNI 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, in accordance with the contract drawings, regardless of cut/fill depth.
- Following regrading, the work area shall be fine graded and made ready for topsoil, seed, and mulch. Tolerance in elevation shall be 25 mm.

The work shall include excavating, hauling, handling and placing in embankments, shaping, compacting, trimming of earth material and the management of excavated material.

Excess and/or unsuitable excavated material related to cut/fill of existing and new ditches/swales shall be removed from site at no additional cost to the contract.

#### Basis of Payment

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

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

## **B22. TOPSOIL, SEED AND MULCH**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS MUNI 802 and OPSS MUNI 804, the following shall also apply:

The work of this item shall include supply and application of topsoil, seed and **erosion control blanket** to roadway side slopes disturbed by construction within the project limits and as noted on the contract drawings or otherwise directed by the Contract Administrator or NPCA.

Areas to be seeded shall be graded to provide proper drainage. Any areas on private property shall also be included.

Any unnecessary damage to front lawns, boulevards, or grassed areas caused by the Contractor's carelessness shall be reinstated at the Contractor's own expense.

### Topsoil

Topsoil shall be a PREMIUM BLEND, weed free, and naturally sterilized through composting.

The blend shall consist of:

- 50% Triple Mix (30% mixture of topsoil, sands, and shredded wood mulch/30% mixture of black organic compost and manure/30% mixture of peat loam); and
- 50% Premium Topsoil (50% mixture of topsoil, sands, and shredded wood mulch/ 25% mixture of black organic compost/ 25% mixture of composted cow manure).

In general, the resulting topsoil mix should meet the following parameters:

pH:	6.5 – 7.5
Potassium:	100 – 120 ppm
Phosphorous:	15 – 30 ppm
Magnesium:	100 – 120 ppm
Organic Matter:	≥ 3%

Unless otherwise specified, the minimum depth of applied Premium Blend Topsoil shall be 100mm.

### Hydraulic Seed & Mulch

Hydraulic seed and mulch shall be placed in accordance with OPSS.MUNI 804.

The seed mix shall meet the requirements of the "Standard Roadside Mix" outlined in Appendix Table A-1 of OPSS.MUNI 804. Quality Assurance and specifically Performance Measures will be per OPSS.MUNI 804.08.01.

All as shown on the Contract Drawings.

### Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work, and ensure growth within the one year maintenance period.

## **B27. REMOVAL OF EXISTING ITEMS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS MUNI 510, the following shall also apply:

The work of this item shall include the complete removal and off-site disposal of the following items:

- a) Concrete Slab: removal and disposal of the tapered extension of the base concrete slab that extends beyond the north end of the culvert.
- b) Gabion Walls: removal and disposal of gabion baskets and gabion stone fill located at the north and south ends of the structure.
- c) Steel Beam Guide Rail and Posts: removal and disposal of steel beam guide rail and posts on the north and south sides of the structure, including buried end treatments.

The Contractor shall remove, salvage, and reinstate any roadway signs.

As shown on the Contract Drawings.

All concrete removals shall be by full depth saw cutting, unless otherwise approved by the Contract Administrator.

The use of Rig Mounted Breakers shall not be permitted.

Blasting shall not be permitted for any work under this item.

This item shall also include supplying, erecting, maintaining and removing any temporary supporting structures that may be required during the work.

All removed materials become the property of the Contractor (unless otherwise noted) and from thereon, it is the Contractor's full responsibility and liability to arrange for the removal and disposal of said materials outside the area of work at the Contractor's own expense. The Contractor shall obtain all necessary disposal approvals from various government agencies including, but not limited to, the Niagara Peninsula Conservation Authority, the Ministry of the Environment and the Ministry of Natural Resources.

Materials excavated under this item shall be disposed of off-site by the Contractor at an approved landfill site, in accordance with the General Requirements, unless otherwise noted for salvage.

When hauling rubble, excavated materials or fill from or to the site, the Contractor shall comply with the requirements of the Highway Traffic Act.

The Contractor shall provide the Contract Administrator with written authorization for use of any private disposal site, including a brief description of the key terms and conditions of the authorization.

#### Basis of Payment

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

### **B36. STEEL BEAM GUIDE RAIL AND POSTS**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 721, the following shall also apply:

The work of this item shall include:

- Supply and placing of new Guide Rail System – Steel Beam Type M20, Steel Post with Plastic Offset Block – Single Rail as per OPSD 912.185.
- Allowance for adjustments or working around abandoned Bell line, if required.
- **Allowance for adjustments, the use of forming tubes, and/or working around Terrawall reinforced earth retaining wall components, including tie-backs and geogrid.**

All as shown on the Contract Drawings.

#### Basis of Payment

Payment at the unit price bid for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

### **B37. ENERGY ATTENUATING SYSTEM - MASH SOFTSTOP TERMINAL SYSTEM**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 732, the following shall also apply:

The work of this item shall include the following:

- Supply and install new SoftStop Terminal System as per OPSD 922.165.
- Supply and install Type III or Type IV object markers (stickers) on the ends of each SoftStop.
- Allowance for adjustments or working around abandoned Bell line, if required.
- **Allowance for adjustments, the use of forming tubes, and/or working around Terrawall reinforced earth retaining wall components, including tie-backs and geogrid.**

#### Basis of Payment

Payment at the unit price bid shall be payment in full for all labour, equipment and materials necessary to complete the work.

### **F1. CONCRETE IN SUBSTRUCTURE**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 904, the following shall also apply:

The work of this item shall include:

- Supply and place concrete in subgrade void at south end (outlet),
- Supply and place concrete in apron cut-off walls at both ends of the structure.

The Contractor shall allow for placing the concrete under cold weather conditions, including any insulation or heating, as required.

The estimated volume of concrete for this item is 15m<sup>3</sup>. The Contractor shall verify the concrete quantities.

All as shown on the Contract Drawings.

#### Basis of Payment

Payment at the unit price bid shall be payment in full for all labour, equipment and materials necessary to complete the work.

## **F2. WATERWAY PROTECTION AND DEWATERING**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, OPSS MUNI 182, and OPSS MUNI 805, the following shall also apply:

The work of this item shall include:

- Design and submission of shop drawings for a containment system sufficient to ensure that no concrete debris or equipment/tools will enter into the Watercourse.
- Design and submission of shop drawings and a dewatering plan for excavation, dewatering, and the management and control of water from dewatering operations.
- Supply of all materials, equipment, and labour required to construct, maintain, and dismantle dewatering installations and water management installations for the dewatering of excavation, removal, and new construction areas.
- The installation, maintenance and removal of a waterway protection system to prevent and isolate surface run-off from entering the work site.
- Supply of all materials, equipment and labour required to construct, maintain and dismantle a waterway protection containment system to contain all materials during removals and new construction.
- Compliance with Niagara Peninsula Conservation Authority (NPCA) Permit and the following Waterway Protection Special Provision:

### Watercourse/Fisheries Protection - General

At all times, the Contractor's operations shall be controlled so as to prevent the entry of deleterious materials to watercourse. Controls shall include, but not be restricted to, the following:

- a) Erosion and sedimentation control, and protection of the environmentally sensitive area, shall be in compliance with requirements specified in the Contract.
- b) Watercourses shall not be diverted, or blocked, and temporary watercourse crossings shall not be constructed or utilized, unless otherwise specified in the Contract.
- c) Construction material, excess material, construction debris, and empty containers shall be stored away from watercourses and watercourse banks.
- d) All equipment maintenance and refuelling shall be controlled so as to prevent any discharge of petroleum products. Vehicular maintenance and refuelling shall be conducted away from watercourses and watercourse banks.



Erosion and Sedimentation Control - General

Silt control devices shall be constructed before the commencement of any related cut or fill.

The Contractor shall arrange construction operations to minimize the time interval between commencement and completion of any work that disturbs earth surfaces. Commencement of such work shall be considered to have occurred when the original stabilizing ground cover has been removed, including grubbing, or has been covered with fill material. Completion of such work shall be considered to have occurred when the specified cover material (seed and mulch, seed and erosion control blanket, sod, rip rap etc.) has been applied.

Unless otherwise specified, the period in which the time interval is permitted shall be determined by the Contract Administrator.

Run-off from construction materials and any stockpiles shall be contained and discharged so as to prevent entry of sediment to the watercourse.

A 20m stand-by supply of prefabricated silt fence barrier shall be maintained at the Contract site prior to commencement of grading operations and throughout the duration of the contract.

Operation of Contractors equipment shall:

- a) be kept to the minimum necessary to perform the specified work.
- b) comply with operational constraints specified in the Contract.
- c) proceed in a continuous fashion so as to minimise the duration of work.

In addition, the Contractor shall take measures and provide such protection system or systems to ensure the following:

- a) water flow shall be isolated from the work area; and
- b) materials that result from the work or that are disturbed by the same, shall be prevented from entering the open portion of watercourses.

The protection system or systems shall cover the following:

- a) all phases of work, and transitions between phases of the work.
- b) installation, operation, and removal of the protection system.
- c) stabilisation of disturbed fill and earth materials, until treatment with the specified cover material (seed and cover, rip rap etc.)

The Contractor shall submit to the Contract Administrator written notice a minimum of 14 calendar days prior to the date that permission is requested to proceed with this work. The notice shall be comprehensive, and shall provide descriptions, working drawings and schedules that detail the sequence of this work, and the provision of temporary water passage associated with each stage of same.

Permission to proceed with the above will be provided if the Contract Administrator determines that the details of the notice meet the requirements of this supplemental special provision. Whenever the proposals with which the Contractor was permitted to proceed with the work are found by the Contract Administrator to be ineffective, changes shall immediately be made so as to ensure watercourse/fisheries protection.

#### Basis of Payment

The Contractor will be allowed to invoice fifty-per-cent of the lump sum price once the Waterway Protection/Dewatering systems are constructed and all protection measures are in place. The remaining balance will be paid once the Waterway Protection/Dewatering systems have been fully dismantled and all Waterway Protection/Dewatering measures are no longer required.

### **F3. STAINLESS REINFORCING STEEL**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 905, the following shall also apply:

The work of this item shall include, supply and placing of:

- Stainless Reinforcing Steel as designated by 'S' on the Contract Drawings for the cut off walls extending from the existing concrete slab.

All as shown on the Contract Drawings.

#### Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

### **F4. DOWELS INTO CONCRETE**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 904, the following shall also apply:

The work of this item shall include the installation of Dowels into Concrete in the following locations:

- Install dowels for cut-off walls, epoxy grouted with a minimum embedment of 200mm into sound concrete at the north and south ends of the existing concrete slab.
- The epoxy grout is to be “Hilti HIT RE500” or an approved equivalent as per MTO DSM # 9.30.25. The Contractor shall ensure that the diameter of the drilled hole is sufficient to meet the requirements of the bar, bar coating (if any), and the epoxy grout.

All as shown on the Contract Drawings.

#### Basis of Payment

Payment at the unit price bid shall be payment in full for all labour, equipment, and materials necessary to complete the work. Payment for the supply of dowels shall be under Item F3.

### **F5. RETAINING WALLS WITH TIEBACKS**

#### **PART 1 GENERAL**

##### 1.1. SUMMARY

This work shall consist of furnishing, assembling and filling woven wire mesh baskets with rock and backfill material to form a Maccaferri Terrawall (or approved equal) as specified in the contract in conformity with the dimensions, lines and grades shown on the plans, or as determined by the engineer and manufacturer. The mesh shall be coated with a high abrasion resistant polymer coating, Maccaferri Polimac (or approved equal).

Supply and placing of fascia rock fill shall be included under this item as specified below.

Supply and placing of geogrid and/or geotextile shall be included under this item as specified below.

Supply and placing of granular backfill shall be included under Item B3 - Granular Materials.

**The Contractor shall make allowance for installation of posts for Steel Beam Guide Rails and Energy Attenuating Systems within the vicinity of the retaining wall and tiebacks/geogrid.**

The work under this specification includes furnishing, assembling, filling and tying Terrawall MSE system placed on a prepared surface as specified, and in accordance with the lines, grades, and dimensions shown on plans or otherwise established in the field by project engineer.

## 1.2. CONTACT

Jose Fernandez, B.Sc. (Civil Eng.) MBA  
Technical Sales Representative  
Maccaferri Canada Ltd.  
(226)-218-0007  
[j.fernandez@maccaferri.com](mailto:j.fernandez@maccaferri.com)

## 1.3. REFERENCES

ASTM A370	Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A123/A123	Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products
ASTM A902	Terminology Relating to Metallic Coated Steel Products
ASTM A975	Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire with Polymeric Coating)
ASTM B117	Practice for Operating Salt Spray (Fog) Apparatus
ASTM D6711	Standard Practice for Specifying Rock to Fill Gabions, Revet Mattresses, and Gabion Mattresses
ASTM D746	
AASHTO M288	Standard Specification for Geosynthetic Specification for Highway Applications
EN 10245-1	Steel wire and wire products - Organic coatings on steel wire – Part 1: General Rules
EN 60229:2008	Electric Cables – Tests on Extruded Oversheaths with a Special Protective Function
ISO 4892-3	Plastics – Methods of Exposure to Laboratory Light Sources – Part 3: Fluorescent UV Lamps

## 1.4. DEFINITIONS

### 1.4.1 Terrawall

Terrawall is an MSE retaining wall system comprised of continuous double twisted wire mesh that forms the top wrap, facing and continues in to the reinforced soil zone as a reinforcement. Galvanized welded wire panel is used in the fascia behind the double twisted wire mesh for additional stiffness and the support struts (brackets) are used to achieve the wall batter.

## 1.5. FABRICATION

Terrawall shall be manufactured and shipped with all components mechanically connected at the production facility. The facing, top wrap and reinforcing panel of the Terrawall shall be woven into a single unit. Horizontal reinforcing steel rods shall be placed in the double twist of the front face of the unit at approximately every 162 mm centers. A welded wire panel is placed behind the front face.

## 1.6. SUBMITTALS

Preapproved product under these specifications is PoliMac™ coated Terrawall System supplied by Maccaferri Canada Ltd.

Submit the following list of items for Contract Administrator's review and approval prior to material supply.

- i. Manufacturer's product technical specifications, and product installation instructions.
- ii. Wire mesh sample with edge and selvedge wires. Minimum sample size shall be 0.3m. by 0.3m.
- iii. PDF shop drawings and details, signed and sealed by a Professional Engineer.

## 1.7. QUALITY ASSURANCE

### 1.7.1 Wire and Ring Fastener

The owner or owner's representative reserves the right to test additional samples to verify the submitted test records. For equivalent products, furnish minimum three randomly selected field samples of lacing wire and ring fasteners 60 days prior to start of installation. Samples shall be tested to verify following property requirements in accordance with ASTM A975.

- i. Wire thickness
- ii. Tensile strength
- iii. High Abrasion Resistant (HAR) polymer coating thickness
- iv. Ring fastener individual pull apart strength

### 1.7.2 Installation

The General Contractor shall have personals with at least 3 years of experience installing Terrawall and have installed a minimum of 1000 m<sup>2</sup> fascia of Terrawall in last three years. In case the General Contractor does not meet the qualifications based on the above requirements, acquire necessary onsite training from manufacturer prior to construction or the services of a qualified Terrawall subcontractor must be utilized. A manufacturer's representative shall provide reasonable installation support.

## 1.8. DELIVERY, STORAGE, AND HANDLING

Terrawall units shall be delivered with all components mechanically connected at the production facility. All Terrawall units are supplied in the collapsed form, folded and bundled, for ease of shipping and handling. The bundles of Terrawall units shall be labeled to show the dimensions of the Terrawall units and the number of pieces. Lacing wire shall be shipped in coils, fasteners in boxes and preformed stiffeners in bundles.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

#### **2.1.1 High Abrasion Resistant (HAR) Polymer Coated Terrawall**

Terrawall shall be manufactured with a non-raveling mesh made by twisting continuous pairs of wires through three half turns (commonly called double twisted) to form a hexagonal-shaped opening. Terrawall wire diameters, mesh opening sizes, and tolerances shall comply with the requirements of ASTM A975. HAR polymer coated Terrawall is manufactured from heavily Zinc Coated soft temper steel and overcoated with high abrasion resistant polymer as per ASTM A975. Wire and wire mesh used for manufacturing Terrawall shall meet the following requirements:

##### **2.1.1.1 Wire Tensile Strength**

The wire used for the manufacturing Terrawall and lacing wire, shall have a maximum tensile strength of 485 MPa, in accordance with ASTM A641/A641M.

##### **2.1.1.2 Elongation**

The test shall be carried out on a sample at least 300 mm long, and the elongation shall not be less than 12%, in accordance with ASTM A370.

##### **2.1.1.3 Metallic Zn Coating**

The minimum quantities of Zn coating shall be according to the ASTM A641/A641M, Class III soft temper coating.

##### **2.1.1.4 Adherence of Zn Coating**

The adherence of the Zn coating to the wire shall be such that, when the wire is wrapped six turns around a mandrel having four times the diameter of the wire, it does not flake or crack when rubbing it with the bare fingers, in accordance with ASTM A641/A641M.

##### **2.1.1.5 HAR Polymer Coating**

The technical characteristics and ageing resistance of the HAR polymer coating comply with EN 10245-1.

2.1.1.5.1 *Colour:* grey RAL 7012.

2.1.1.5.2 *Resistance to UV radiation:* the tensile strength and elongation at break of the base compound after 2500 hours of exposure to QUV-A (ISO 4892-3 mode 1) do not change more than 25% from the initial test results.

2.1.1.5.3 *Chemical resistance:* the HAR polymer resists the chemical agents in concentrations that are representative of soil and water normally found in civil works.

2.1.1.5.4 *Outwearing accelerated ageing test in salt spray:* when the HAR polymer coated wire mesh is subjected to the neutral salt spray test (ASTM B117) after 6000 hours of exposure the mesh does not show more than 5% of DBR (Dark Brown Rust).

2.1.1.5.5 *Resistance to abrasion:* the HAR polymer coating does not expose metal wire when tested in accordance with procedure described in par. 4.1.2.1 of EN 60229:2008, after 100,000 cycles with a vertical force of the steel angle of 20N.

2.1.1.6 Standard Wire Diameters

All wire diameters shall comply with ASTM A975 as presented in Table 1.

Table 1 Standard Wire Diameters			
	Lacing Wire	Mesh Wire	Selvedge Wire
Wire Diameter Int Ø (mm)	2.20	2.70	3.40
Wire Tolerance (±) Ø (mm)	0.10	0.10	0.10
Min. Quantity/Zn (g/m <sup>2</sup> )	214	244	259
Wire + Polymer Diameter. (mm)	3.20	3.70	4.40

2.1.1.7 Mesh Characteristics and Strength Requirements

The wire mesh characteristics and minimum strength requirements shall be in accordance with ASTM A975 as presented in Table 2. The tolerances on the hexagonal double twisted wire mesh opening, D (see Fig. 1), shall not exceed ± 10%.

Table 2 Mesh Characteristics and Minimum Strength	
Mesh Type	8x10/ HAR Polymer Coated
Mesh Opening, D	83 mm
Mesh Tensile Strength	50.0 kN/m
Punch Test Resistance	23.6 kN
Connection Strength	17.5 kN/m

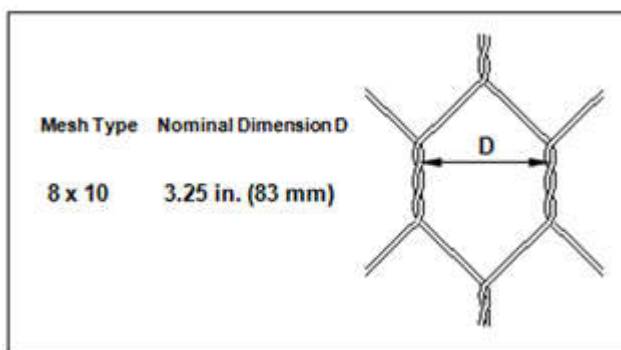


Fig. 1 Mesh type and opening

2.1.1.8 Standard Terrawall sizes are listed in Table 3. All sizes and dimensions are nominal. The tolerances on width, length and height of units shall not exceed  $\pm 5\%$ .

Table 3 Standard Terrawall Sizes			
Length (m)	Width (m)	Height (m)	Angle (degrees)
2	2	0.65	84
3	2	0.65	
4	2	0.65	

### 2.1.2 Ring Fasteners

Stainless steel rings for HAR polymer coated Terrawall shall be in accordance with ASTM A975 section 6.3. The ring fasteners properties shall be as presented in Table 4.

Table 4 Ring fastener property requirements		
Property	Value	Test Method
Wire diameter	3.05 mm	ASTM A313, Type 302, Class I
Wire tensile strength	1530 to 1744 MPa	ASTM A313, Table 5

### 2.1.3 Reinforcing Steel Bracket

Reinforcing steel brackets shall be Zinc-5 % Aluminum-Mischmetal Alloy coated in accordance with ASTM A123 and shall meet the properties presented in Table 5.

Table 5 Reinforcing steel bracket property requirements		
Property	Value	Test Method
Wire diameter	7.85 mm, size W8	ASTM A82
Tensile strength	550 MPa	ASTM A82 Table 1

### 2.1.4 Stone Fill

#### 2.1.4.1 Properties

Rocks shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure.

#### 2.1.4.2 Gradation

The rock used to fill Terrawall unit fascia shall be large enough to prevent individual pieces from passing through the mesh openings. Fascia rocks shall range between 100 mm and 200 mm. The range in sizes shall allow for a variation of 5% oversize and/or 5% undersize rock by weight. In all cases, undersize rock shall be placed within the interior of the Terrawall unit fascia and shall not be placed on the exposed surface of the structure.



2.1.4.3 Source

Rock may be naturally available or crushed rock produced by any suitable method and using any device that yields the required size limits.

2.1.5 Select Backfill

Select backfill material shall be approved by the owner or owner’s representative and shall meet the project specifications. FHWA select backfill requirements for MSE walls are as shown in Table 6.

Table 6 FHWA select backfill requirements		
Gradation: AASHTO T-27	US sieve size	Percent passing
	4 in (102 mm)	100
	No. 40 (0.425 mm)	0-60
	No. 200 (0.075 mm)	0-15%
Plasticity index, PI: AASHTO T-90	PI ≤ 6	
Soundness: AASHTO T-104	The materials shall be substantially free of shale or other soft, Poor durability particles. The material shall have a magnesium Sulfate soundness loss of less than 30 percent after four cycles (or a sodium sulfate value less than 15 percent after five cycles).	

2.1.6 Geogrid

When geogrid is used as a primary reinforcement, it shall meet the project design and specification requirements.

2.1.7 Geotextile

Separation geotextile used behind the fascia stone shall meet AASHTO M288 and/or project specification requirements.

**PART 3 EXECUTION**

**3.1 FOUNDATION PREPARATION**

The foundation for Terrawall MSE wall shall be graded level for a width equal or exceeding the length of reinforcement or as shown in the project plans. Prior to beginning select backfill placement, the area under the wall footprint should be prepared and compacted. Any soft or loose material that is encountered should be compacted or removed and replaced. Any debris that will obstruct the proper installation shall also be

removed, and the voids carefully backfilled and compacted. If frozen ground conditions are encountered, contact project geotechnical engineer for further recommendations.

Geotextile shall be placed between the fascia stone and select backfill as indicated on the drawings or as directed by the project engineer. The geotextile shall be installed with adequate overlap. The minimum overlap distance in the transverse or longitudinal direction is 0.6 m.

### 3.2 ASSEMBLY AND INSTALLATION

Terrawall units are supplied folded flat and packed in bundles. The units shall be opened and unfolded one by one on a flat, hard surface and remove any shipping folds. This can be done by placing the fold over a 2 in. x 4 in. (50 mm x 100 mm) board and walking along the sides. Front panel shall be lifted to a vertical position and steel brackets shall be installed to achieve a 6-degree fascia batter. The top end of the bracket shall be connected around an intersection on the welded wire panel. The bottom end of the bracket shall be connected around the reinforcing steel wire and a double twist in the woven wire mesh. Wire mesh reinforcement panels shall be connected to the adjacent panel maximum every 3 ft (1.0 m) to avoid movement during backfilling. Fig. 2 shows assembled Terrawall unit.

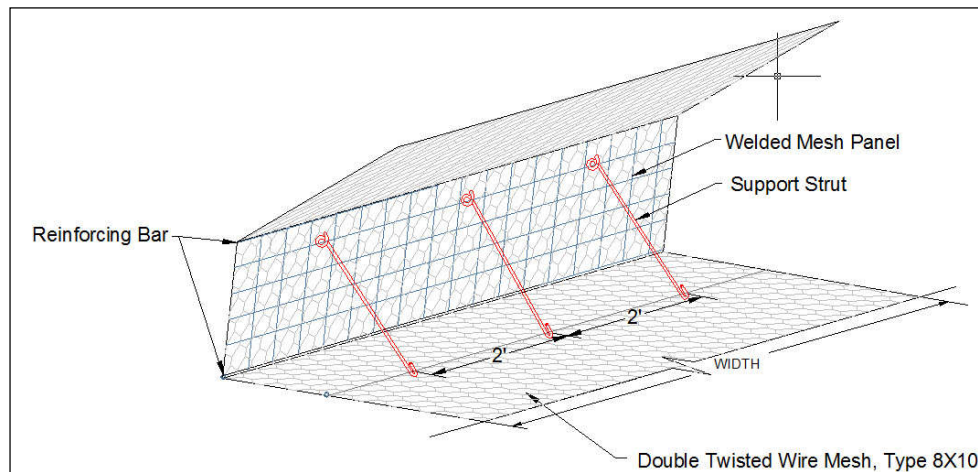


Fig. 2 Assembled Terrawall unit

After assembly, Terrawall units shall be individually placed on the approved surface to the lines and grades as shown or as directed by project engineer. Terrawall units shall be aligned and connected to each other before placing fascia rock using lacing wire or ring fasteners.

### 3.3 FASTENING PROCEDURES

#### 3.3.1 Lacing Wire

When using lacing wire, cut a piece of wire approximately 1.5 times the length of the edge to be laced. Longer edges shall be connected by several lengths of lacing wire. The mesh

panels shall be pulled tightly together during the tying operation. For vertical joints, starting at the bottom end of the panel, the lacing wire shall be twisted and wrapped two times around the bottom selvedge and then double and single loops shall be alternated through at intervals not exceeding 150 mm as shown in Fig. 3. The operation shall be finished by looping around the top selvedge wire. The use of pliers to assemble the units with lacing wire is recommended to create tighter joints.

### 3.3.2 Ring Fasteners

When ring fasteners are used to connect Terrawall unit panels, spacing of the rings shall be in accordance with ASTM A975, minimum strength requirements of mesh and connections. In any case, the maximum ring spacing along the edges shall not exceed 150 mm as shown in Fig. 3. Ring fasteners shall be installed along all the edges. Each ring fastener shall be closed, and the free ends of the fastener shall overlap a minimum of 25 mm as shown in Fig 3. The use of either a mechanical or a pneumatic fastening tool is required to install ring fasteners.

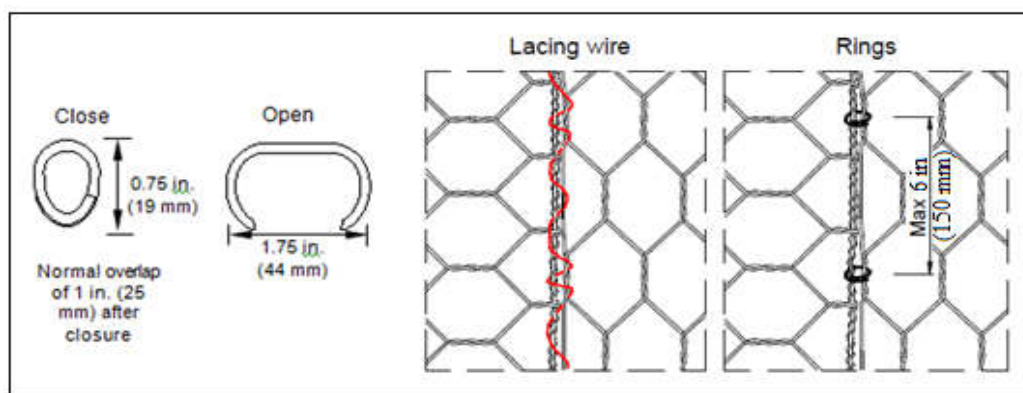


Fig. 3 Fastening procedures

### 3.4 ROCK AND SELECT BACKFILL PLACEMENT

The Fascia Rock shall be placed on the back of the facing element to the thickness specified by the engineer. Fascia rocks and select backfill shall be placed simultaneously in layers. A separation geotextile shall be placed between the rocks and select backfill. Select backfill material shall be placed in lifts not greater than 300 mm and compacted to at least 95% of maximum dry density at optimum moisture content determined by AASHTO T99 method D.

### 3.5 SPECIAL ADAPTATION

Where a complete Terrawall cannot be installed because of space limitations, the Terrawall units shall be cut, folded or overlapped, and securely connected to suit existing site conditions.

### 3.6 MAINTENANCE

No routine maintenance is required. If the damage is localized in the fascia, the Terrawall units can be repaired by filling the voids (if any) with rock, and patching it using a new piece of double twisted wire mesh. New piece of wire mesh shall be connected to undamaged mesh with a minimum overlap of 225 to 300 mm using lacing wire or fasteners

### 4.0 BASIS OF PAYMENT

Accepted Terrawall™ or approved equal will be paid at the unit lump sum price as included in the contract, and includes all labour, material, and equipment for the complete installation.

**The Contractor shall make allowance for installation of posts for Steel Beam Guide Rails and Extruders within the vicinity of the retaining wall and tiebacks.**

Payment at the lump sum contract price bid shall be payment in full for all labour, equipment and materials not covered within other contract items, as necessary to complete the work.

### **F6. GEOTEXTILE**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 511, the following shall also apply:

The work of this item shall include supplying and placing geotextile as follows:

- Class II Geotextile underlying all rip-rap.

All as shown on the Contract Drawings.

#### Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

### **F7. RIVER STONE – R10**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 511, the following shall also apply:

The work of this item shall include supply and placing of one layer of river stone on top of the Rip-Rap in the creek bed.

The gradation of river stone shall match the gradation specified for R-10 rip-rap specified under OPSS MUNI 1004, as shown in the Contract Drawings.

Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

**F8. RIP-RAP – R50**

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document and OPSS MUNI 511, the following shall also apply:

The work of this item shall include supply and placing:

- R-50 rip-rap with a minimum thickness of 300mm in the creek bed, along the roadway/creek side slopes, as shown in the Contract Drawings.

Basis of Payment

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

**F9. UTILITY ALLOWANCE**

The Contractor shall make allowance for working around or under any existing utilities.

There is an abandoned bell cable in the vicinity of the existing culvert. The cable may be over or under the existing culvert. If encountered, the abandoned cable shall be cut and disposed of by the Contractor.

Basis of Payment

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.