



# Credit Valley Conservation Seed Mixes

Version 1.1 August 2014

In partnership with Ontario Seed Company (OSC), CVC has developed a variety of seed mixes that are appropriate for use within the Credit River watershed. These seed mixes are suitable for restoration and naturalization projects, as well as for planting plans for stormwater management facilities.

These mixes have been designed to be used in a variety of soil and moisture conditions. Proponents can select any supplier to purchase their seed mixes but CVC recommends suppliers who obtain their seeds locally.

## Application Rate

These seed mixes should be applied at a rate of 22 - 25 kg/ha (21-23 lbs/acre) or at a rate of 250g/90 m<sup>2</sup> (1/2lb/1000 sq. ft) for smaller areas.

### CVC 1 - FACW Wetland Meadow Mixture

Common Name	Scientific Name	% of Mix
Bebb's Sedge	Carex bebbii	1%
Blue Lobelia	Lobelia siphilitica	1%
Blue Vervain	Verbena hastata	10%
Boneset	Eupatorium perfoliatum	1%
Dark Green Bulrush	Scirpus atrovirens	1 %
Fox Sedge	Carex vulpinoidea	27%
New England Aster	Aster novae-angliae	2%
Purple Stemmed Aster	Aster puniceus	1%
Fowl Bluegrass	Poa palustris	20%
Soft Rush	Juncus effusus	2%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Square Stemmed Monkey Flower	Mimulus ringens	2%
Swamp Milkweed	Asclepias incarnata	1%
Tall Mannagrass	Glyceria grandis	2%
Virginia Wild Rye	Elymus virginicus	27%
Woolgrass	Scirpus cyperinus	1%
		100%

### CVC 2 - Naturalized Wetland Mixture

Common Name	Scientific Name	% of Mix
Bebb's Sedge	Carex bebbii	5%
Boneset	Eupatorium perfoliatum	1%
Fowl Bluegrass	Poa palustris	25%
Fox Sedge	Carex vulpinoidea	40%
Dark Green Bulrush	Scirpus atrovirens	5%
Nodding Bur Marigold	Bidens cernua	1%
Purple Stemmed Aster	Aster puniceus	1%
Rice Cutgrass	Leersia oryzoides	7%
Soft Rush	Juncus effusus	10%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Stalk-grain Sedge	Carex stipata	2%
Swamp Milkweed	Asclepias incarnata	1%
Tall Mannagrass	Glyceria grandis	1%
		100%

### CVC 3 - Valley Land Mixture (semi moist)

Common Name	Scientific Name	% of Mix
Fowl Manna Grass	Glyceria striata	2%
Fowl Bluegrass	Poa palustris	30%
Fox Sedge	Carex vulpinoidea	30%
Path Rush	Juncus tenuis	8%
Virginia Wild Rye	Elymus virginicus	30%
		100%

### CVC 4 - Wet Meadow Marsh Mix

Common Name	Scientific Name	% of Mix
Blue Vervain	Verbena hastata	9%
Blue Flag	Iris versicolor	1%
Dark Green Bulrush	Scirpus atrovirens	8%
Purple Stemmed Aster	Aster puniceus	1%
Fox Sedge	Carex vulpinoidea	35%
New England Aster	Aster novae-angliae	1%
Rice Cutgrass	Leersia oryzoides	1%
Soft Rush	Juncus effusus	5%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Square Stemmed Monkey Flower	Mimulus ringens	1%

Swamp Milkweed	<i>Asclepias incarnata</i>	1%
Virginia Wild Rye	<i>Elymus virginicus</i>	35%
Wool Grass	<i>Scirpus cyperinus</i>	1%
		100%

### CVC 5 - Acid Soil Wetland Mix

Common Name	Scientific Name	% of Mix
Bebb's Sedge	<i>Carex bebbii</i>	1%
Creeping Bentgrass	<i>Agrostis stolonifera</i>	12%
Fox Sedge	<i>Carex vulpinoidea</i>	35%
Boneset	<i>Eupatorium perfoliatum</i>	1%
Dark Green Bulrush	<i>Scirpus atrovirens</i>	5%
Nodding Bur Marigold	<i>Bidens cernua</i>	1%
Soft Rush	<i>Juncus effusus</i>	10%
Stalk-grain Sedge	<i>Carex stipata</i>	2%
Virginia Wild Rye	<i>Elymus virginicus</i>	32%
Wool Grass	<i>Scirpus cyperinus</i>	1%
		100%

### CVC 6 - Early Succession Wet Meadow Mix

Common Name	Scientific Name	% of Mix
Bebb's Sedge	<i>Carex bebbii</i>	5%
Purple Stemmed Aster	<i>Aster puniceus</i>	1%
Fowl Bluegrass	<i>Poa palustris</i>	25%
Fox Sedge	<i>Carex vulpinoidea</i>	25%
Great Blue Lobelia	<i>Lobelia siphilitica</i>	1%
New England Aster	<i>Aster novae-angliae</i>	1%
Path Rush	<i>Juncus tenuis</i>	3%
Canada Goldenrod	<i>Solidago canadensis</i>	2%
Soft Rush	<i>Juncus effusus</i>	5%
Stalk-grain Sedge	<i>Carex stipata</i>	4%
Tall Manna Grass	<i>Glyceria grandis</i>	2%
Virginia Wild Rye	<i>Elymus virginicus</i>	25%
Wild Bergamot	<i>Monarda fistulosa</i>	1%
		100%

### CVC 7 - Upland Native Meadow Mix

Common Name	Scientific Name	% of Mix
Black Eyed Susan	Rudbeckia hirta	10%
Blue Wood (Heart Leaved Aster)	Aster cordifolius	1%
Canada Anemone	Anemone canadensis	1%
Canada Goldenrod	Solidago canadensis	2%
Common Milkweed	Asclepias syriaca	2%
Evening Primrose	Oenothera biennis	25%
Grass Leaved Goldenrod	Euthamia graminifolia	1%
Meadow/Open Field Sedge	Carex granularis	15%
New England Aster	Aster novae-angliae	1%
Riverbank Wild Rye	Elymus riparius	40%
Virgins Bower	Clematis virginiana	1%
Wild Bergamot	Monarda fistulosa	1%
		100%

### CVC8 - Wetland Restoration Mix

Common Name	Scientific Name	% Mix
Bebb's Sedge	Carex bebbii	1%
Blue Vervain	Verbena hastata	3%
Boneset	Eupatorium perfoliatum	1%
Canada Anemone	Anemone canadensis	1%
Canada Bluejoint	Calamagrostis canadensis	1%
Canada Goldenrod	Solidago canadensis	1%
Dark Green Bulrush	Scirpus atrovirens	6%
Fowl Bluegrass	Poa palustris	20%
Fowl Mannagrass	Glyceria striata	1%
Fox Sedge	Carex vulpinoidea	20%
Grass Leaved Goldenrod	Euthamia graminifolia	1%
Purple Stemmed Aster	Aster puniceus	1%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Spreading Bentgrass	Agrostis stolonifera	20%
Stalk-grain Sedge	Carex stipata	1%
Swamp Milkweed	Asclepias incarnata	1%
Virginia Wild Rye	Elymus virginicus	20%
		100%

## Cover Crop

A cover crop should be utilized with each of the seed mixes. The cover crop will act as a nurse crop, provide short term erosion control and weed control.

## Application Rate

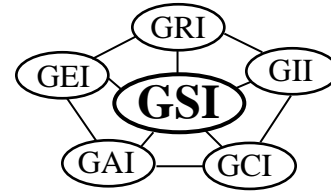
The cover crop should be applied at rate of 22kg/ha (20lbs/acre).

Common Name	Scientific Name
Common Oats	Avena sativa
Buckwheat	Fagopyrum esculentum

Note that CVC does not recommend the use of Annual Ryegrass (*Lolium multiflorum*) due its allelopathic properties as well as its confusion and potential hybridization with Perennial Rye (*Lolium perenne*).

# Geosynthetic Institute

475 Kedron Avenue  
Folsom, PA 19033-1208 USA  
TEL (610) 522-8440  
FAX (610) 522-8441



Rev. 2: March 3, 2016  
Revision Schedule: pg. 7

## GRI -GT12(a)\* - ASTM Version Standard Specification

Standard Specification for

### “Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials”<sup>SM</sup>

This specification was developed by the Geosynthetic Research Institute (GRI) with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

#### 1. Scope

- 1.1 This specification covers nonwoven geotextile test properties for subsequent use as protection (or cushioning) materials.

Note 1: The typical use will be as a protective covering or underlayment of a geomembrane against puncture or tear due to rock, stones, concrete or other hard surfaces and/or objects.

- 1.2 This specification sets forth a set of physical, mechanical and endurance properties that must be met, or exceeded by the geotextile being manufactured.

- 1.3 In the context of quality systems and management, this specification represents a manufacturing quality control (MQC) document.

Note 2: Manufacturing quality control represents those actions taken by a manufacturer to assure that a product represents the stated objective and properties set forth in the specification.

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\*This GRI standard specification is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version and it is kept current on the Institute’s Webpage <<geosynthetic-institute.org>>.

- 1.4 This standard specification is intended to assure good quality and performance of fabrics used as geotextile protection materials but is possibly not adequate for the complete specification in a specific situation. Additional tests, or more restrictive values for the tests indicated, may be necessary under conditions of a particular application.
- 1.5 This standard specification does not address installation practices or design guidance. Both of these items are addressed in the literature dealing with this particular application.

## 2. Referenced Documents

### 2.1 ASTM Standards

- D 4354 Practice for Sampling of Geosynthetics for Testing
- D 4533 Test Method for Trapezoidal Tearing Strength of Geotextiles
- D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
- D 4759 Practice for Determining the Specification Conformance of Geosynthetics
- D 4873 Guide for Identification, Storage and Handling of Geotextiles
- D 5035 Test Method for Breaking Strength and Elongation of Textile Fabrics (2” Strip Method)
- D 5261 Test Method for Measuring Mass per Unit Area of Geotextiles
- D 6241 Test Method for Static Puncture Strength of Geotextiles and Geotextile Related Product Using a 50-mm Probe
- D 7238 Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent Condensation Apparatus

### 2.2 AASHTO Specification

M288-05 Geotextile Specification for Highway Applications

## 3. Definitions

- 3.1 Formulation - The mixture of a unique combination of ingredients identified by type, properties and quantity. For nonwoven geotextiles, a formulation is defined as the exact percentages and types of resin(s), additives and/or carbon black.
- 3.2 Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications [ref. EPA/600/R-93/182].

Note 3: This particular specification for nonwoven protection geotextiles falls under the concept of MQC.

- 3.3 Minimum Average Roll Value (MARV) – For geosynthetics, a manufacturing quality control tool used to allow manufacturers to establish published values such that the user/purchaser will have a 97.7% confidence that the property in question will meet published values. For normally distributed data, “MARV” is calculated as the typical value minus two (2) standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.
4. Material Classification and Formulation
    - 4.1 This specification covers geotextiles used as protection (or cushioning) materials.
    - 4.2 The type of resins are usually polypropylene, polyester or polyethylene, but other resins are also possible in this regard.
    - 4.3 The type of geotextile style is designated as a nonwoven since research has shown these fabrics to be most effective in the typical applications toward which this specification is directed. While needle-punched nonwovens are usually used, heat bonded and resin dipped manufacturing styles (or others) can also be considered.
5. Specification Requirements
    - 5.1 The geotextiles for use as protection (or cushioning) materials shall conform to Table 1. The table is given in English units and in SI (Metric) units. The conversion from English to SI units is “soft”.
    - 5.2 Since there are a number of geotextile puncture test methods available, Table 2 is provided. Either of these tests can be considered to be an alternative test replacing ASTM D4833 in Table 1. The decision to make such a replacement must be agreed upon by the parties involved. The table is given in English units and in SI (Metric) units. The conversion from English to SI units is “soft”.
    - 5.3 The required values for all properties in Tables 1 and 2 are to be minimum average roll values (MARV) except UV resistance which is a minimum value.
6. Workmanship and Appearance
    - 6.1 The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning.
    - 6.2 General manufacturing procedures shall be performed in accordance with the manufacturer’s internal quality control guide and/or documents.



## 7. MQC Sampling, Testing, and Acceptance

7.1 Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling shall be in accordance with the most current modification of ASTM Standard D 4354, using the section titled, "Procedure for Sampling for Purchaser's Specification Conformance Testing." In the absence of purchaser's testing, verification may be based on manufacturer's certifications as a result of testing by the manufacturer of quality assurance samples obtained using the procedure for Sampling for Manufacturer's Quality Assurance (MQA) Testing. A lot size shall be considered to be the shipment quantity of the given product or a truckload of the given product, whichever is smaller.

7.2 Testing shall be performed in accordance with the method referenced in this specification for the indicated application. The number of specimens to test per sample is specified by each test method. Geotextile product acceptance shall be based on ASTM D4759. Product acceptance is determined by comparing the average test results of all specimens within a given sample to the specification MARV. Refer to ASTM D 4759 for more details regarding geotextile acceptance procedures.

## 8. MQC Retest and Rejection

8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality manual.

## 9. Shipment and Storage

9.1 Geotextile labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

9.2 Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

9.3 During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.

10. Certification

- 10.1 The contractor shall provide to the engineer a certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the geotextile.
- 10.2 The manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.
- 10.3 The manufacturer's certificate shall state that the finished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. A person having legal authority to bind the manufacturer shall attest to the certificate.
- 10.4 Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

**USA Units**

Table 1(a) – Required Properties, Test Methods and Values for Geotextiles Used as Geomembrane Protection (or Cushioning) Materials

Property <sup>(1)</sup>	Test Method ASTM	Unit	Mass/Unit Area (oz/yd <sup>2</sup> )					
			10	12	16	24	32	60
Mass per unit area	D5261	oz/yd <sup>2</sup>	10	12	16	24	32	60
Grab tensile strength	D4632	lb	230	300	370	450	500	630
Grab tensile elongation	D4632	%	50	50	50	50	50	50
Trap. tear strength	D4533	lb	95	115	145	200	215	290
Puncture (CBR) strength	D6241	lb	700	800	900	1100	1700	2400
UV resistance <sup>(2)</sup>	D7238	%	70	70	70	70	70	70

Notes:

- (1) All values are MARV except UV resistance; it is a minimum value.
- (2) Evaluation to be on 2.0 inch strip tensile specimens per ASTM D 5035 after 500 lt. hrs. exposure.

**S.I. (Metric) Units**

Table 1(b) – Required Properties, Test Methods and Values for Geotextiles Used as Geomembrane Protection (or Cushioning) Materials

Property <sup>(1)</sup>	Test Method ASTM	Unit	Mass/Unit Area (g/m <sup>2</sup> )					
			340	406	542	812	1080	2000
Mass per unit area	D5261	g/m <sup>2</sup>	340	406	542	812	1080	2000
Grab tensile strength	D4632	kN	1.02	1.33	1.64	2.00	2.25	2.80
Grab tensile elongation	D4632	%	50	50	50	50	50	50
Trap. tear strength	D4533	kN	0.42	0.51	0.64	0.89	0.96	1.27
Puncture (CBR) strength	D6241	kN	3.11	3.56	4.00	4.90	7.56	10.60
UV resistance <sup>(2)</sup>	D7238	%	70	70	70	70	70	70

Notes:

- (1) All values are MARV except UV resistance; it is a minimum value.
- (2) Evaluation to be on 50 mm strip tensile specimens per ASTM D5035 after 500 lt. hrs. exposure.

## **Adoption and Revision Schedule**

**for**

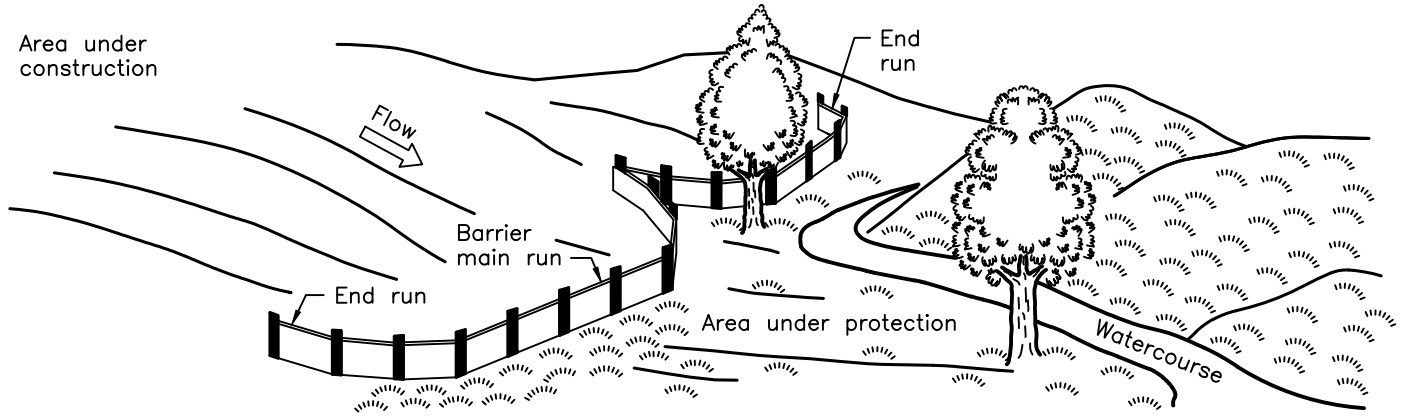
### **“Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials”**

Original: February 18, 2002

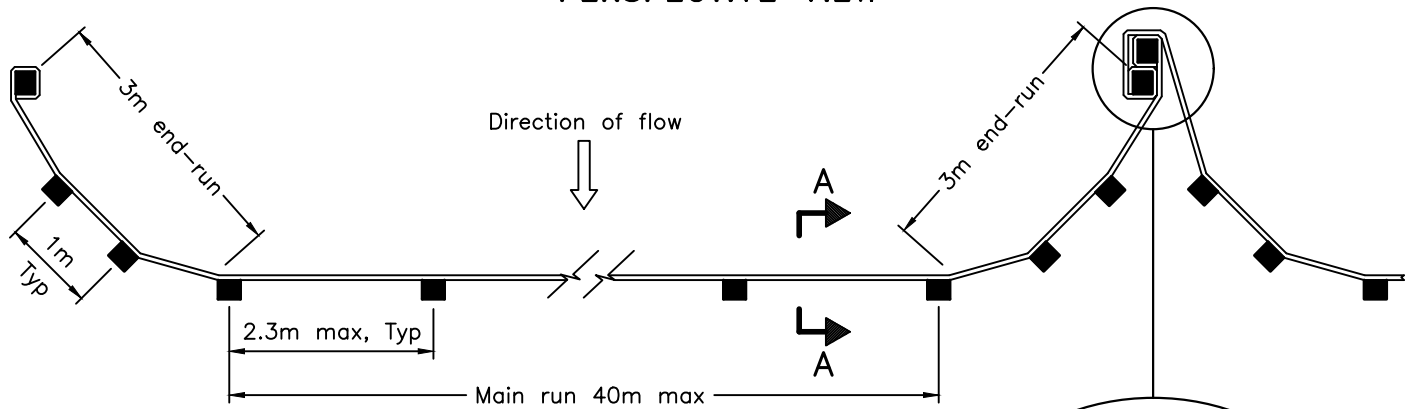
Revision 1: December 18, 2012: Replaced ASTM D4355 with ASTM D7238

Revision 2: March 3, 2016: Deleted ASTM D4833 Pin Puncture and ASTM D5495 Pyramid Puncture from the Standard

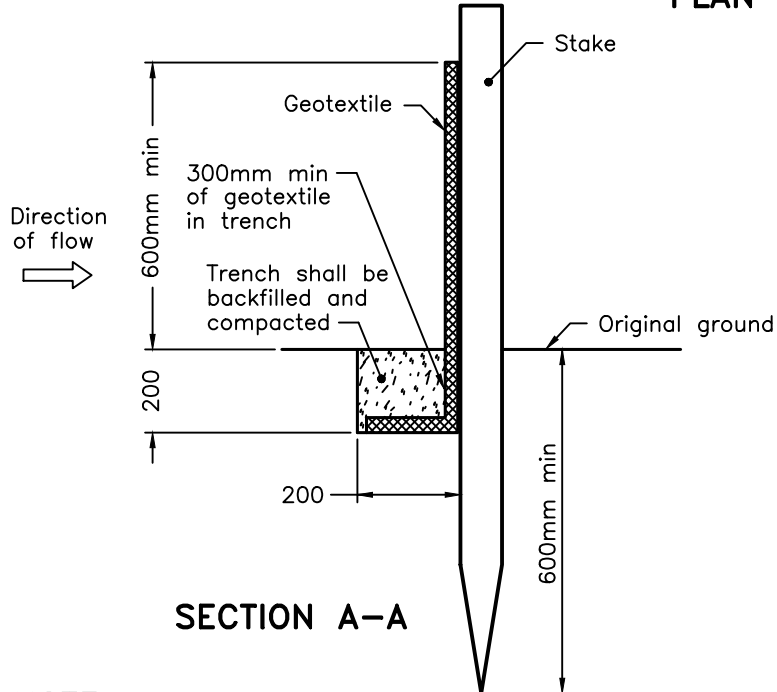
Area under construction



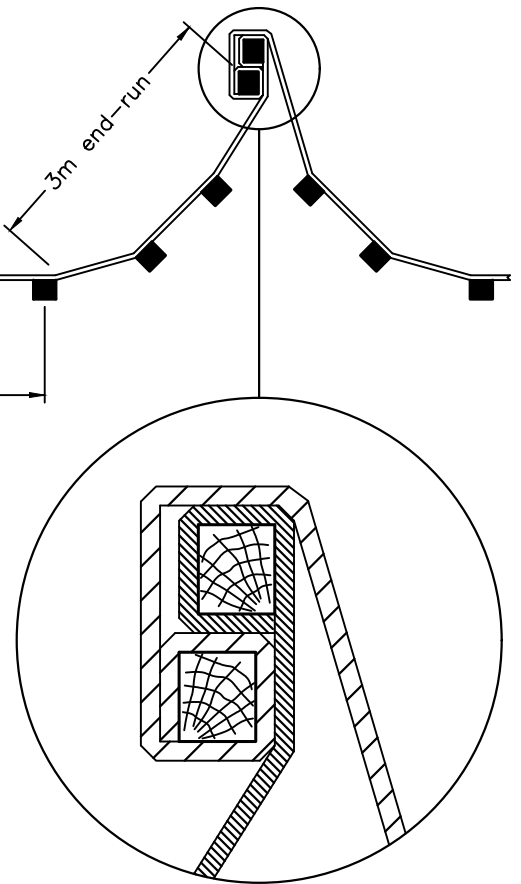
PERSPECTIVE VIEW



PLAN



SECTION A-A



JOINT DETAIL

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

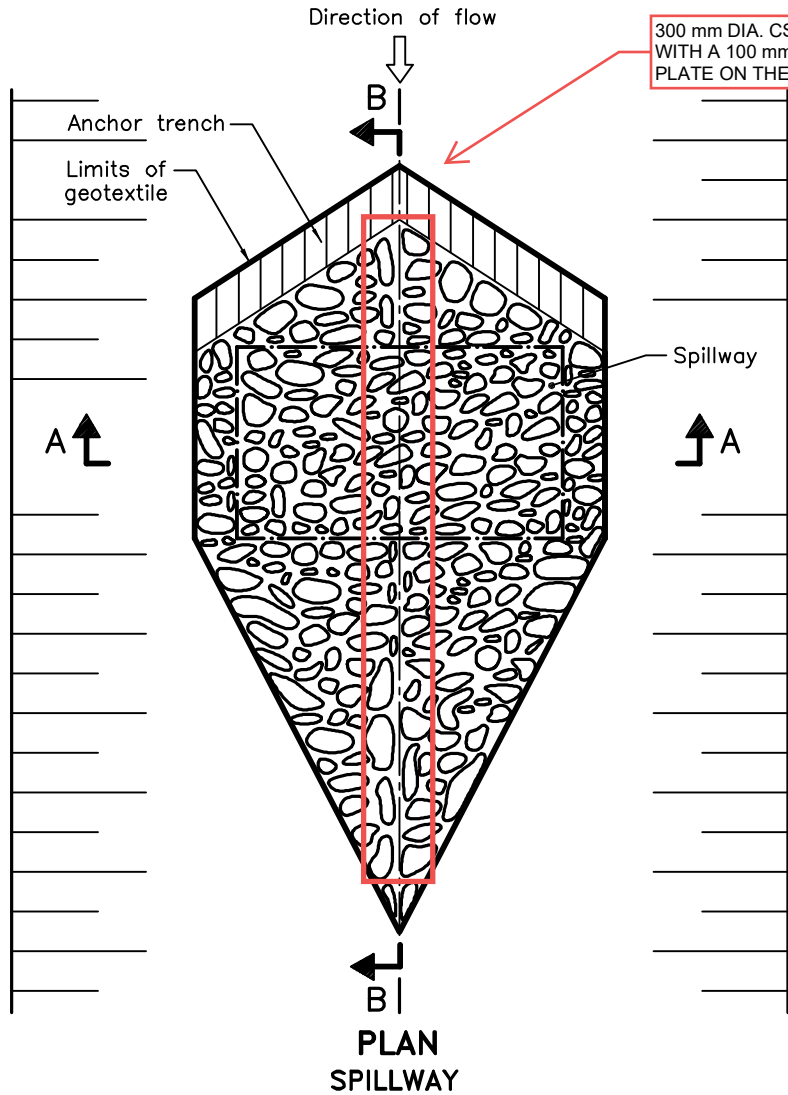
Nov 2021

Rev 3

LIGHT-DUTY  
SILT FENCE BARRIER



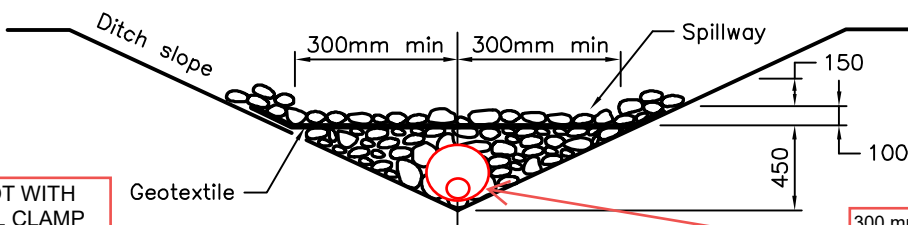
OPSD 219.110



300 mm DIA. CSP CULVERT WITH A 100 mm DIA. ORIFICE PLATE ON THE INLET

MODIFIED ROCK FLOW CHECK DAM (MODIFIED OPSD 219.210) COMPLETED WITH 300 mm DIA. CSP CULVERT WITH A 100 mm DIA. ORIFICE PLATE ON THE INLET

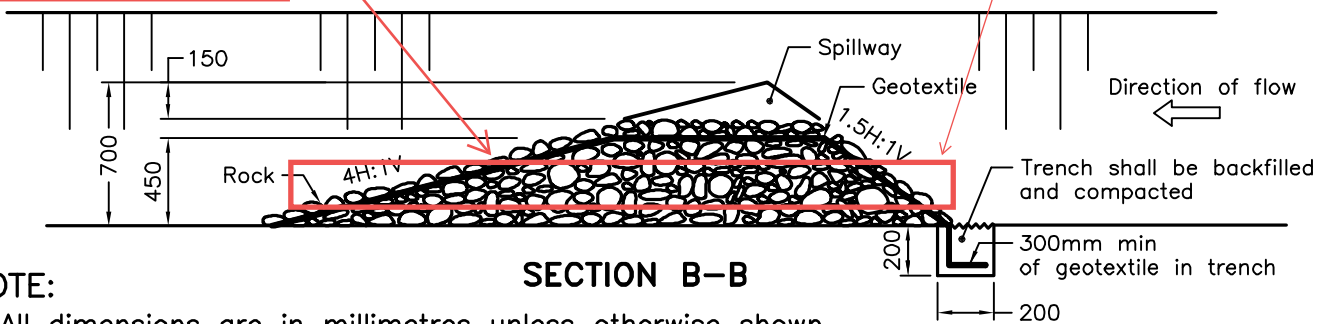
PLAN SPILLWAY



GEOTEXTILE BOOT WITH STAINLESS STEEL CLAMP AROUND CULVERT PROTRUSION

300 mm DIA. CSP CULVERT WITH A 100 mm DIA. ORIFICE PLATE ON THE INLET

SECTION A-A



SECTION B-B

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

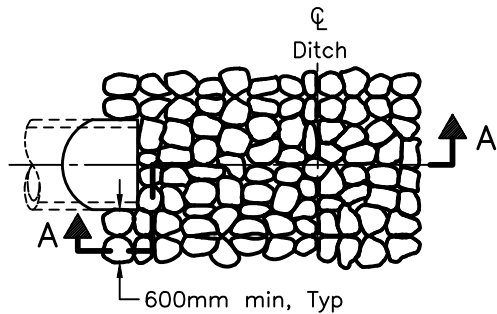
Nov 2015 Rev 2

TEMPORARY ROCK FLOW CHECK DAM V-DITCH

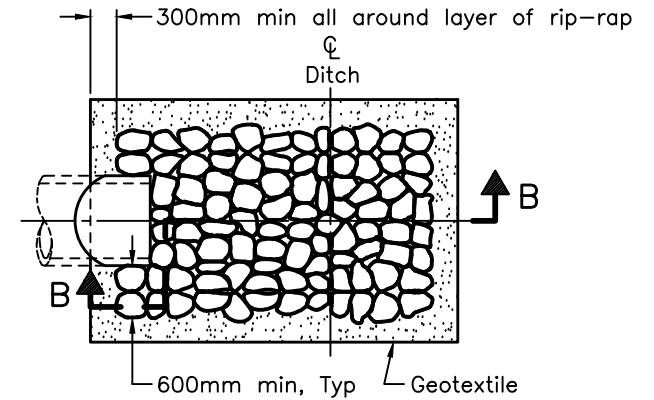
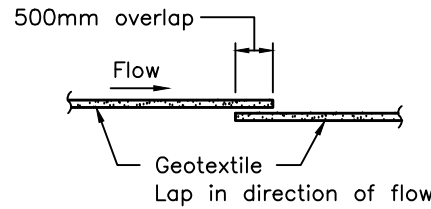
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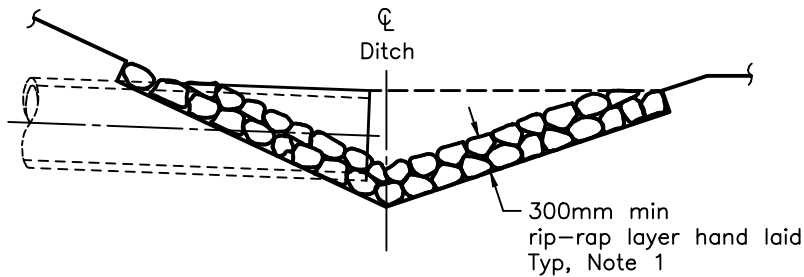
OPSD 219.210



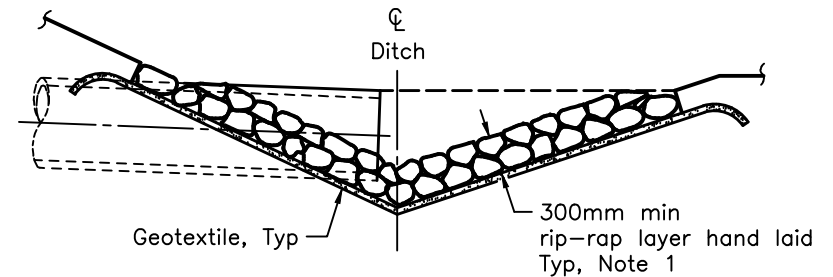
PLAN  
CUT OR FILL



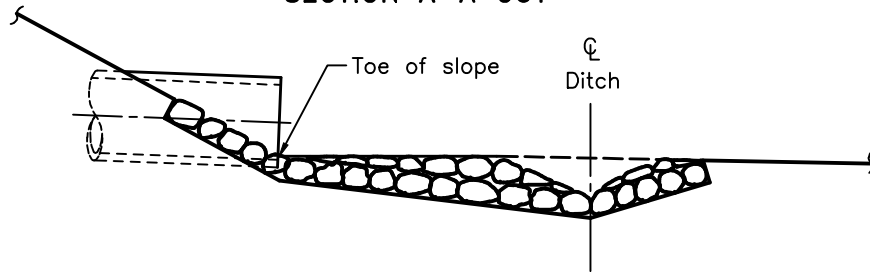
PLAN  
CUT OR FILL



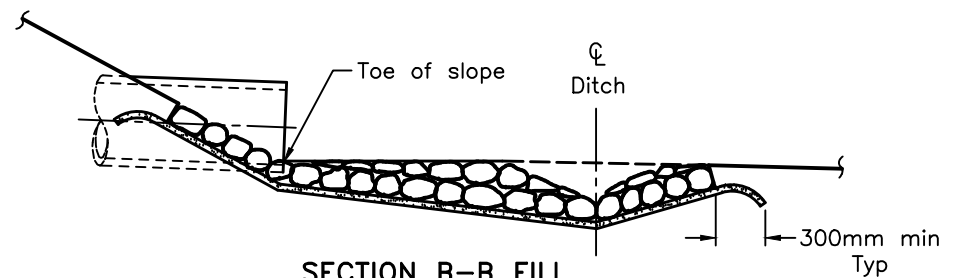
SECTION A-A CUT



SECTION B-B CUT



SECTION A-A FILL



SECTION B-B FILL

TYPE A - WITHOUT GEOTEXTILE

TYPE B - WITH GEOTEXTILE

**NOTES:**

1 The thickness of the rip-rap layer shall be at least 1.5 times the rip-rap mean diameter.

A All dimensions are in millimetres unless otherwise shown.

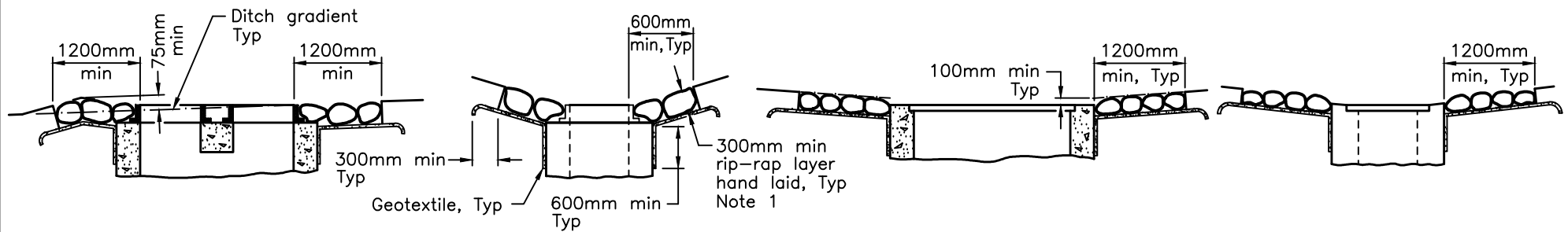
ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2018 Rev 3

**GENERAL RIP-RAP LAYOUT  
FOR SEWER AND CULVERT OUTLETS**

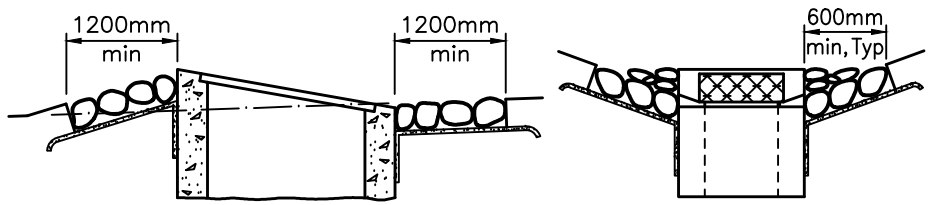


**OPSD 810.010**

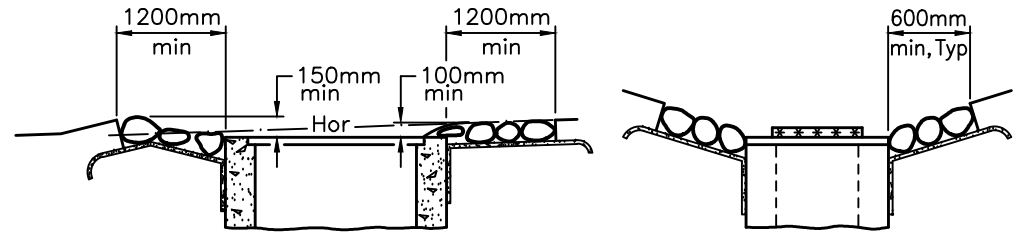


Ditch Longitudinal Section  
Ditch Cross-Section  
**TWIN INLET-INTERMEDIATE**

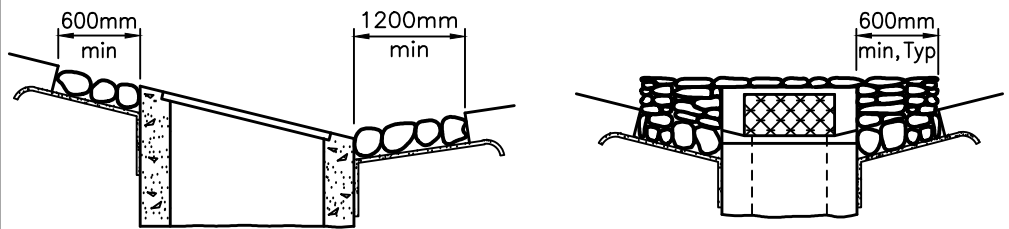
Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-SUMP**



Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-INTERMEDIATE**




Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-INTERMEDIATE**

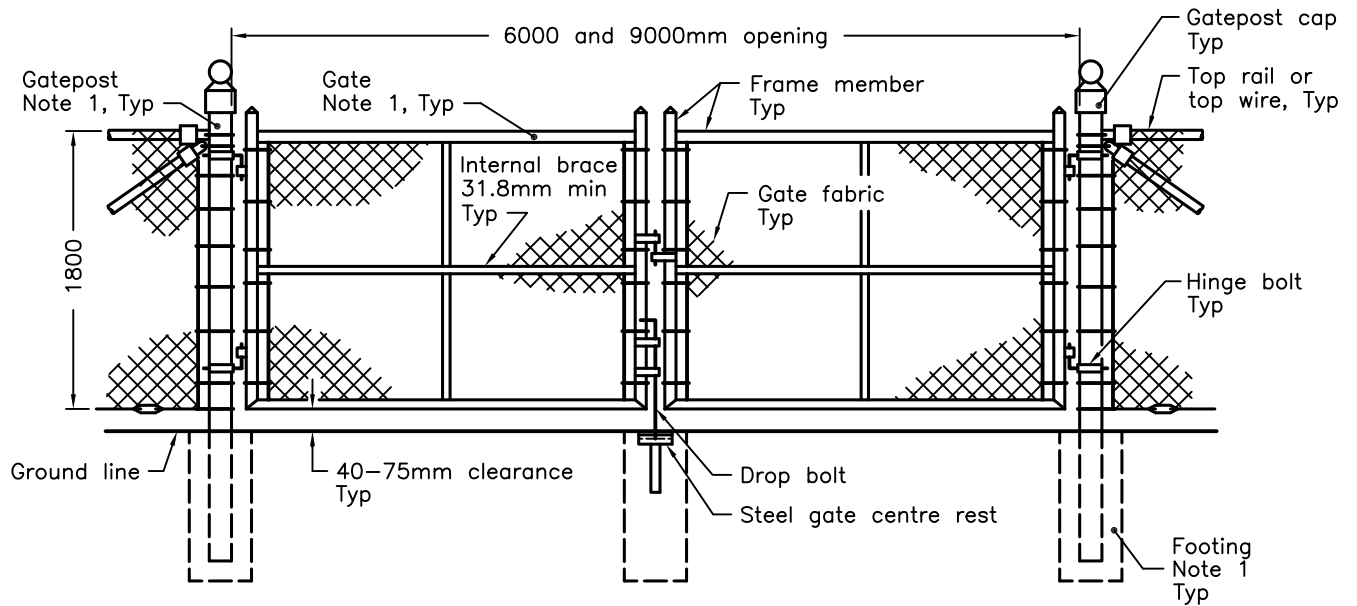


Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-END OF DITCH**

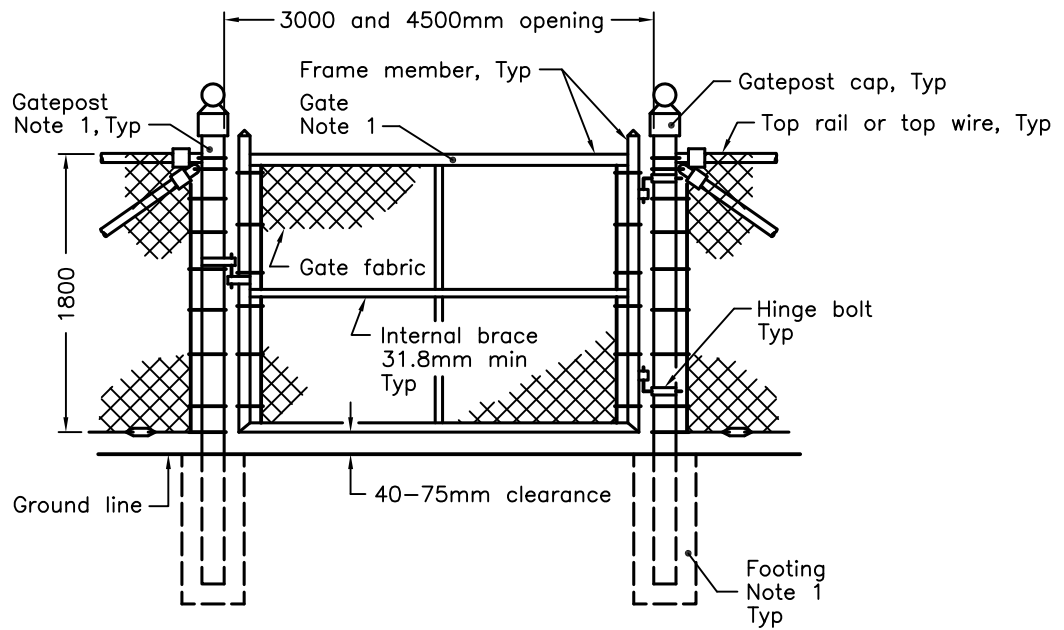
**NOTES:**  
 1 The thickness of the rip-rap layer shall be at least 1.5 times the rip-rap mean diameter.  
 A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2018	Rev	3
<b>GENERAL RIP-RAP LAYOUT FOR DITCH INLETS</b>				
				
<b>OPSD 810.020</b>				





**DOUBLE SWING GATE OPENING**



**SINGLE SWING GATE OPENING**

**NOTES:**

- 1 For footing details and Gate and Gatepost Details Table refer to OPSD 972.132.
- A Gates as viewed from the roadway.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

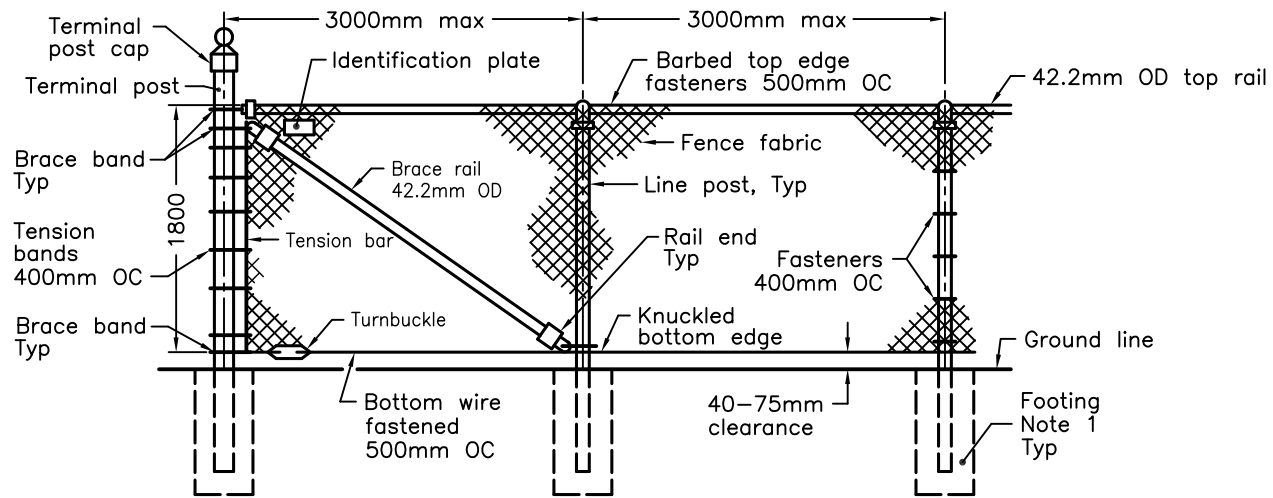
Nov 2012

Rev 2

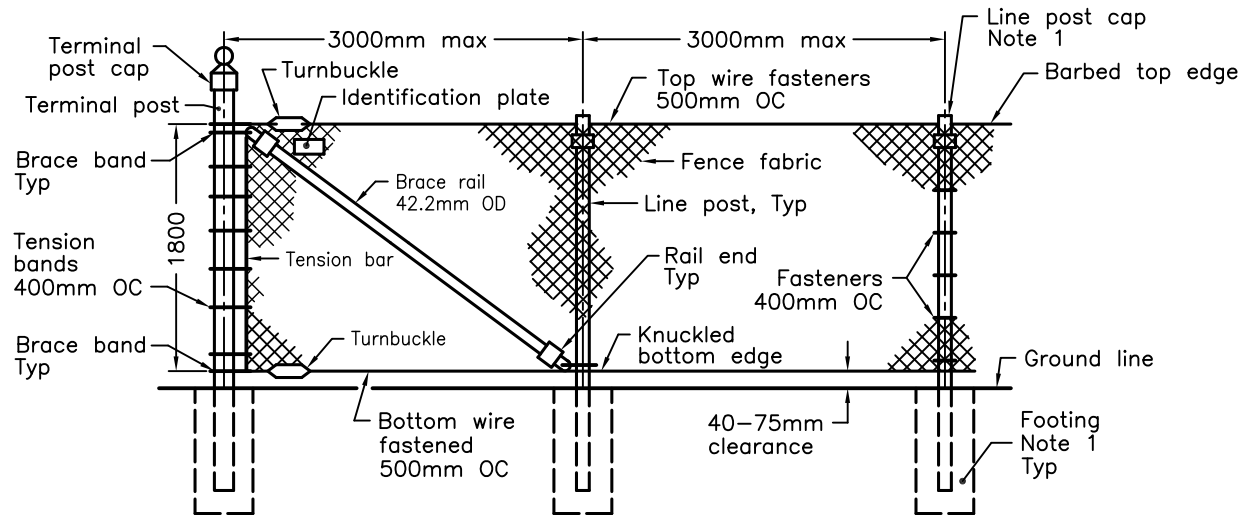
FENCE, CHAIN-LINK  
COMPONENT - GATE



**OPSD 972.102**



**CHAIN-LINK FENCE WITH TOP RAIL**

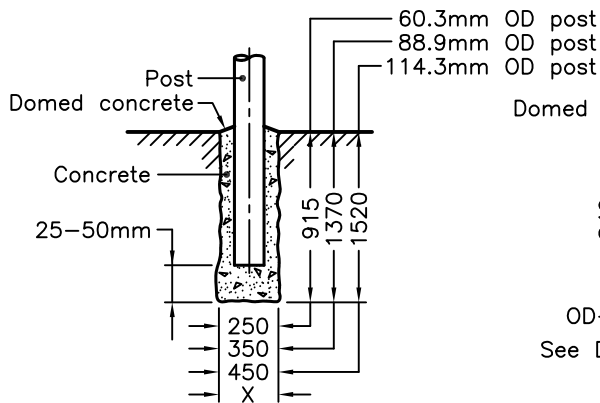


**CHAIN-LINK FENCE WITH TOP WIRE**

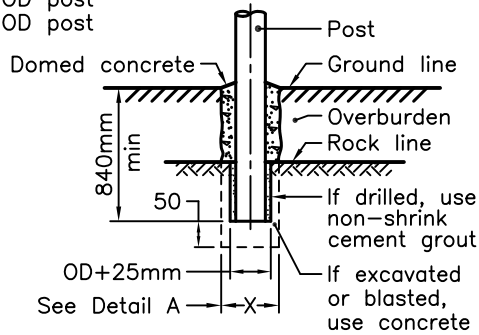
**NOTES:**

- 1 For footing details and line post cap detail refer to OPSD 972.132.
- A Fence as viewed from the roadway.
- B All dimensions are in millimetres unless otherwise shown.

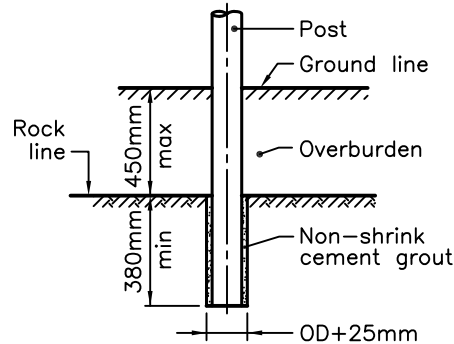
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2	
<b>FENCE, CHAIN-LINK</b>			
<b>INSTALLATION - ROADWAY</b>			
<b>OPSD 972.130</b>			



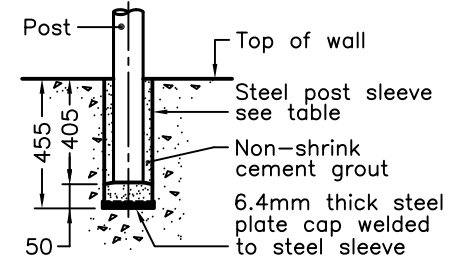
**DETAIL A  
FOOTING IN EARTH**



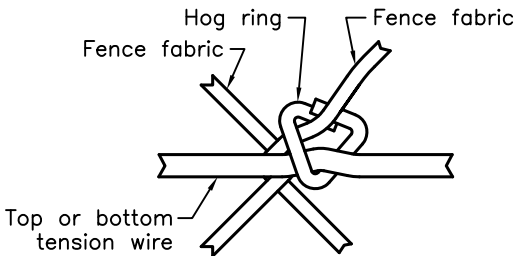
**DETAIL B  
FOOTING IN SHALE, LOOSE  
OR FRIABLE ROCK, OR SOLID  
ROCK WITH MORE THAN 450mm  
OVERBURDEN**



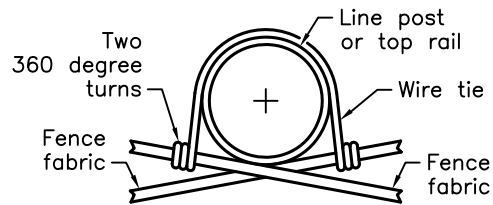
**DETAIL C  
FOOTING IN SOLID ROCK  
LESS THAN 450mm  
OVERBURDEN**



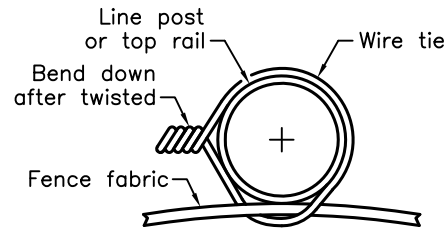
**DETAIL D  
FOOTING IN  
RETAINING WALL**



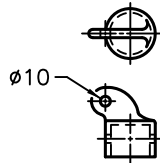
**HOG RING TIE DETAIL**



**MANUALLY FASTENED  
WIRE TIE DETAIL**



**POWER FASTENED  
WIRE TIE DETAIL**



**62mm ID  
LINE POST CAP  
DETAIL**

POST DETAILS TABLE (Note 1)						
Post/Frame Member Type	OD	Post Length		Wall Thickness	Nominal Weight kg/m (Note 2)	
		Standard	Retaining Walls			
		m	m			
Line post	60.3	2.6	2.0	3.91	5.4	
Terminal Post	88.9	2.9	2.3	5.49	11.3	
Gates (Single 3.0m, Double 6.0m)	Gatepost	88.9	2.6	n/a	5.49	11.3
	Frame Members	42.2	n/a	n/a	3.56	3.4
Gates (Single 4.5m, Double 9.0m)	Gatepost	114.3	2.9	n/a	6.02	16.1
	Frame Members	48.3	n/a	n/a	3.68	4.0
Post Sleeves	Line Post	88.9	n/a	0.455	5.49	11.3
	Terminal Post	114.3	n/a	0.455	6.02	16.1

**NOTES:**

- All posts and frame members are Schedule 40, Regular Grade, steel pipe.
- The actual weight shall not vary by more than 10% of the nominal weight.
- All dimensions are in millimetres unless otherwise shown.

<b>ONTARIO PROVINCIAL STANDARD DRAWING</b>	Nov 2012	Rev 0	
<b>FENCE, CHAIN-LINK DETAILS AND TABLE</b>	-----		
<b>OPSD 972.132</b>			



**GENERAL SPECIFICATION FOR  
THE MANAGEMENT OF EXCESS MATERIALS**

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**APPENDICES**

<b>180-A</b>	<b>Commentary</b>
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**180.01 SCOPE**

This specification covers requirements for the management of excess materials.

Where the management of excess material requirements of other Ontario Provincial Standard Specifications differs from this specification, the requirements of this specification will take precedence.

**180.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **180.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **180.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206      Grading  
OPSS 209      Embankments Over Swamps and Compressible Soils

### **Ontario Provincial Standard Specification, Material**

OPSS 1004    Aggregates, Miscellaneous

### **Canadian and Provincial Statutes**

Environmental Protection Act, R.S.O. 1990, c.E.19-& R.R.O. 1990, Regulation 347  
GENERAL - WASTE MANAGEMENT  
*As amended*

Transportation of Dangerous Goods Act, 1992,  
S.C. 1992, c. 34

Fire Protection and Prevention Act, 1997  
S.O. 1997, CHAPTER 4

### **Provincial Statute**

O. Reg 406/19 On-Site and Excess Soil Management made under the Environmental Protection Act,  
R.S.O. 1990, c.E.19

## Ministry of the Environment, Conservation and Parks (MECP) Publications

### Rules for Soil Management and Excess Soil Quality Standards

#### 180.03 DEFINITIONS

For the purpose of this specification, the definitions in OPSS 182 and the following definitions apply:

**Bituminous Pavement** means any combination of asphaltic material and aggregate, excluding asbestos modified asphaltic material.

**Commercial Waste** means as defined in Regulation 347, under the Environmental Protection Act, Ontario.

**Concrete** means concrete mixtures produced with Portland cement and may include blended hydraulic cement, supplementary cement materials, spent debris and silica sand abrasive blasting media from abrasive cleaning of concrete and reinforcing steel, and concrete brick and block and associated mortar. It may include embedded steel and excludes asbestos modified Portland cement concrete mixtures.

**Disposable Fill** means excess material other than that disposed of at a certified disposal site and that is managed in berms and mounds and as fill other than in road embankments.

**Earth** means as defined in OPSS 206.

**Excess Soil** means as defined in O. Reg 406/19 On-Site and Excess Soil Management.

**Excess Soil Standards** means as defined in O. Reg 406/19 On-Site and Excess Soil Management.

**Excess Material** means material removed under the Work specified in the Contract Documents for which management is not specified and includes surplus and unsuitable materials.

**Ground Water** means subsurface water and water that occurs beneath the water table in soils and rock formations that are fully saturated.

**Manufactured Wood** means wood that is not entirely natural wood.

**Masonry** means clay brick and associated mortar.

**Natural Wood** means stumps, trunks, branches, debris from tree and shrub removal, and wood products that are not treated, coated, or glued.

**Non-Hazardous Solid Industrial Waste** means as defined in Regulation 347, under the Environmental Protection Act, Ontario.

**Qualified Person** means as defined in O.Reg 406/19 On-Site and Excess Soil Management.

**Re-Use** means using, processing, re-processing, or recycling of excess material into a construction material or other useful product and managed by these means for the Contract and other work.

**Reuse Site** means as defined in Rules for Soil Management and Excess Soil Quality Standards.

**Rock** means as defined in OPSS 206.

**Salt-Impacted** means materials that have concentrations of chloride and sodium and values for electrical conductivity and sodium adsorption ratio that could impact the growth of certain types of plants.

**Subject Waste** means as defined as in Regulation 347, under the Environmental Protection Act, Ontario.

**Swamp Material** means as defined in OPSS 209.

**Waste** means excess material that is not managed by re-use, open burning, or as disposable fill and includes any excess material.

## **180.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **180.04.01 Submission Requirements**

#### **180.04.01.01 Notification of Site Selection, and Property Owner Release**

A copy of the completed form OPSF 180-1, Site Selection Notification for Stockpiling Materials Managed Through Re-Use, or OPSF 180-2, Site Selection Notification for Material Managed as Disposable Fill or both shall be submitted to the Contract Administrator and the property owner at least 2 weeks prior to the use of the property. These forms are not required for property owned by the Owner or designated for use in the Contract Documents.

At the completion of such work, a completed copy of the form OPSF 180-3, Property Owner's Release, shall be provided to the Contract Administrator.

The Contractor shall be responsible for any sampling and testing necessary to comply with any requirements imposed by a property owner as a condition of accepting excess material.

#### **180.04.01.02 Verification of Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste**

When excess material is managed by disposal as non-hazardous solid industrial or commercial waste, a copy of the weigh ticket or receipt provided by the disposal site operator shall be submitted to the Contract Administrator on a weekly basis. When such documentation is not available, written confirmation that the waste has been received shall be obtained from the operator of the disposal site and provided to the Contract Administrator within 2 weeks after disposal activities are complete.

Within 3 weeks of the completion of all disposal activities associated with the work, a completed copy of the OPSF 180-5, Waste Quantity Report, shall be provided to the Contract Administrator and shall account for all excess material managed by disposal as solid non-hazardous industrial or commercial waste.

#### **180.04.01.03 Notification of Forest Resource Licensees**

Forest Resource licensees identified in the Contract Documents shall be notified at least 2 weeks prior to commencement of open burning.

#### **180.04.01.04 Environmental Compliance Approval**

When Environmental Compliance Approval(s)/Certificates of Approval for a Waste Management System or a Waste Disposal Site are required, a copy of such approval shall be supplied to the Contract Administrator prior to transporting excess material or waste from the Working Area.

#### **180.04.01.05 Subject Waste Documentation**

For each subject waste listed in the form OPSF 180-4, Subject Waste Classification, that is being shipped from the Working Area to a waste disposal site, the following shall be completed:

- a) The Contract Administrator shall be notified at least 2 weeks prior to the first shipment of subject waste, and at least 24 hours prior to each subsequent shipment of subject waste.
- b) A Regulation 347 manifest with Part B completed by the carrier for each truckload of subject waste, shall be submitted to the Contract Administrator for Part A completion. Copies #1 and #2 of the manifest with Part A and B completed shall be retained by the Contract Administrator and the remaining copies #3 to #6 returned to the carrier.
- c) Copy #6 of the Regulation 347 manifest shall be forwarded to the Contract Administrator at the mailing address indicated on Part A of the manifest, within 4 weeks of the shipment of subject waste from the Working Area.

For each subject waste that is generated by the Contractor's operations and that is not listed in form OPSF 180-4, Subject Waste Classification that is being shipped from the Working Area to a waste disposal site, the following documentation shall be provided to the Contract Administrator.

- a) Prior to shipment of the subject waste:
  - i. Test results from testing to determine the Regulation 347 waste class and characteristics of the subject waste from the Canadian Association for Laboratory Accreditation (CALA) accredited laboratory selected by the Contractor;
  - ii. Notification from the MECP Hazardous Waste Information Network (HWIN) of the registration of the subject waste to obtain a Regulation 347 Generator Registration Number (GRN); and
  - iii. A duplicate of Copy #2 of the Regulation 347 manifest with Parts A and B completed and signed by the generator and carrier respectively.
- b) After shipment of the subject waste:
  - i. Notification of payment of all registration, manifest, and tonnage fees associated with the shipment from the MECP HWIN;
  - ii. A duplicate of Copy #6 of the Regulation 347 manifest with Part C completed and signed by the receiver; and
  - iii. Notification of de-activation of the Regulation 347 GRN in the MECP HWIN.

A record of all test sample numbers and sample dates shall be kept and made available to the Contract Administrator upon request.

**180.04.01.06 Excess Material Audit or Inventory Document**

When an excess material audit or inventory is imposed by statute or is a condition specified in the Contract Documents, a copy of the audit or inventory documents shall be provided to the Contract Administrator.

**180.04.01.07 Alternative Management Condition Approvals**

When certain excess material is to be managed according to the conditions approved in writing by the local district office of MECP and such conditions differ from those specified in Table 1, a copy of such approval shall be provided to the Contract Administrator at least 2 weeks prior to commencement of the work governed by the condition.

**180.04.01.08 Excess Soil Reuse Plan**

A minimum of 14 Days prior to commencing the removal of excess earth from the Working Area, an excess soil reuse plan shall be submitted to the Contract Administrator for excess earth subject to the requirements of O. Reg. 406/19 and Rules for Soil Management and Excess Soil Quality Standards, for information purposes only. Generic excess soil quality standards are specified in Table 3. When required, the services of a qualified person shall be retained according to O.Reg 406/19.



The excess soil reuse plan shall include the following information for each reuse site:

- a) The municipal address (if applicable), latitude and longitude, in NAD83 or WGS84 coordinate system, and description of the reuse site;
- b) The property use of the reuse site and any characteristics associated with the reuse site or nearby properties that may affect the excess soil quality standards applicable to the reuse site;
- c) A description of the undertaking or the identified beneficial purpose for which the excess soil is to be reused;
- d) The estimated quantity of excess soil, including any salt impacted quantities, to be managed at the reuse site and that are necessary for the identified beneficial purpose;
- e) The applicable excess soil quality standards for the reuse site, as determined according to:
  - i. the excess soil standards, and/or;
  - ii. the site-specific excess soil quality standards developed, in accordance with the Rules for Soil Management and Excess Soil Quality Standards, for the reuse site according to the Beneficial Reuse Assessment Tool (BRAT) available on the Government of Ontario website;
- f) Documentation showing that appropriate landowner consultation and disclosure has taken place and confirmation of the site owner's / operator's written consent to accept the excess soil;
- g) Completed copies of OPSF 180-1 and/or OPSF 180-2;
- h) If the reuse site is or will be governed by a site-specific instrument, identify the instrument, the public body responsible for issuing the instrument and any other information relevant to the reuse of excess soil at that site; and
- i) The record keeping/tracking system to be employed, according to the Rules for Soil Management and Excess Soil Quality Standards as applicable, to track excess earth movements during its transportation and placement at the reuse site.

## **180.07 CONSTRUCTION**

### **180.07.01 Conditions on Management of Excess Material - General**

Management of excess material shall be as described in Tables 1 and 2 and the appropriate subsections of this specification unless prior alternative management conditions are approved in writing by MECP.

When an excess material is a mixture of materials, it shall be managed in compliance with the most stringent conditions associated with any of the constituent excess material.

When excess material includes asbestos waste, the asbestos waste shall be managed as specified in the Contract Documents.

Excess materials shall not be permitted in waterbodies and sensitive areas as identified in the Contract Documents, except when re-used according to the appropriate specification.

Excess earth may contain elevated concentrations of chloride and sodium and may have elevated values for electrical conductivity and sodium adsorption ratio. For the purpose of this Contract, excess earth with salt impacts is not considered to be "contaminated" within the meaning of Table 1. Possible salt impacts and applicable legislative requirements shall be considered when excess earth is managed as disposable fill, by stockpiling, or by re-use.

#### **180.07.02 Conditions on Management by Re-Use**

Management of excess material by re-use for incorporation into the work or for other designated re-use shall be as specified in the Contract Documents. Management by re-use shall otherwise be outside the Owner's property. Distance separations described in Table 2 do not apply for the following:

- a) Re-use of excess materials for the same purpose.
- b) Re-use of bituminous pavement, concrete, and masonry within a road right-of-way.
- c) Re-use of concrete as aggregate in bituminous pavement.
- d) Re-use of concrete as rip-rap, gabion stone, or rock protection in compliance with the requirements of OPSS 1004.

Except cutting for construction purposes, excess material consisting of manufactured wood shall not be reprocessed.

#### **180.07.03 Conditions on Management as Disposable Fill**

Management of excess material as disposable fill, including sidecasting of swamp material, within the Owner's property and on other property designated in the Contract Documents shall be as specified in the Contract Documents.

Natural wood and debris from open fires may be managed as disposable fill only within a road right-of-way or on property with a boundary common to a road right-of-way, both within the Contract limits.

Such material shall be top covered by at least 300 mm of earth or topsoil.

#### **180.07.04 Conditions on Management by Open Burning**

Management of excess material by open burning is permitted only when specified in the Contract Documents. Where management by open burning is permitted, it shall be subject to the following conditions and conducted in accordance with the Fire Protection and Prevention Act, 1997 where it applies, and with any applicable, local, municipal by-law(s):

- a) A permit from the Ministry of Natural Resources and Forestry (MNRF) under the Fire Protection and Prevention Act, and/or applicable local or municipal by-law shall be obtained by the Contractor for open burning, as required.
- b) Open burning is prohibited in areas subject to a restricted fire zone order as issued by MNRF or to a smog alert advisory as issued by MECP.

#### **180.07.05 Conditions on Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste**

Management of excess material by disposal as non-hazardous solid industrial or commercial waste at receiving sites designated in the Contract Documents shall be as specified in the Contract Documents.

When receiving sites are not specified in the Contract Documents for management by disposal as non-hazardous solid industrial or commercial waste, such material shall be disposed of at sites identified by the Contractor.

Non-hazardous solid industrial or commercial waste shall be transported from the Working Area directly to a site that has an Environmental Compliance Approval/ Certificate of Approval for a Waste Disposal Site that is valid for non-hazardous solid industrial or commercial waste.

#### **180.07.06 Conditions on Management by Stockpiling**

Management of excess material by stockpiling within the Owner's property and on other property designated in the Contract Documents shall be as specified in the Contract Documents.

Stockpiling shall otherwise be outside the Owner's property.

Stockpiles of bituminous pavement, concrete, and masonry shall be separated according to Table 2 unless either of the following occurs:

- a) Stockpiles are located within a road right-of-way or on property with a boundary common to a right-of-way, both within the Contract limits for a period not exceeding 120 Days.
- b) Stockpiles are located within a provincial or municipal works yard or in a commercially licensed pit or quarry.

For all other excess materials, where Table 1 indicates that stockpiling is subject to management conditions in Table 2, such management conditions only apply to stockpiles that are to be in place for a period exceeding 120 Days.

#### **180.07.07 Conditions on Management by Disposal as Subject Waste**

When an excess material is identified as a dangerous good waste or a subject waste in form OPSF 180-4, Subject Waste Classification, management shall be as follows:

- a) Subject waste shipments shall be manifested and transported directly to a certified waste disposal site.
- b) When the subject waste is also a dangerous good as described in the Transportation of Dangerous Goods Act (TDGA), the carrier shall provide all necessary TDGA labels and placards.

When an excess material generated by the Contractor's operations may be subject waste and it is not identified in form OPSF 180-4, Subject Waste Classification, the Contractor shall be responsible to manage it in accordance with the following:

- a) Conduct sampling and testing using a laboratory certified by the Canadian Association of Laboratory Accreditation (CALA) selected by the Contractor to determine whether it is subject waste and to determine the Regulation 347 waste class and characteristics.
- b) Register all subject waste in the MECP HWIN and obtain a Regulation 347 GRN for disposal.
- c) Package and label all subject waste for transportation and disposal.
- d) Arrange for shipment of all subject waste to a certified waste disposal site using a certified carrier.
- e) Complete Part A of a Regulation 347 manifest including the GRN obtained from the MECP HWIN and provide the manifest to the certified carrier for completion of Part B.
- f) Provide a duplicate of Copy #2 of the Regulation 347 manifest to the Contract Administrator with Parts A and B completed and signed.
- g) Pay all registration, manifest and tonnage fees associated with subject waste disposal in the MECP HWIN.
- h) De-activate the GRN in the MECP HWIN after shipment of all subject waste to a certified waste disposal site is complete and acceptance of the subject waste is acknowledged by the receiver completing and signing Part C of the Regulation 347 manifest.

- i) Provide a duplicate of Copy #6 of the Regulation 347 manifest to the Contract Administrator upon receipt from the receiver.

When an excess material is tested and found not to be a dangerous good waste or a subject waste, it shall be managed according to the Verification of Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste clause.

#### **180.07.08 Excess Earth Quantity Report**

A completed form OPSF 180-6, Excess Earth Quantity Report, shall be submitted to the Contract Administrator not less than 3 Business Days prior to all regularly scheduled site meetings, for information purposes only. The submittal shall account for all excess earth managed as disposable fill, by stockpiling, and by re-use. Revisions shall be highlighted. The form shall confirm the submission date of the corresponding Notification of Site Selection and Property Owner Release forms to the Contract Administrator. A final completed Quantity Report Form OPSF 180-6, shall be submitted to the Contract Administrator prior to Contract Completion, for information purposes only.

#### **180.07.09 Verification of Excess Soil Reuse Plan**

Within 14 Days of the completion of the excess soil reuse plan, a report including records shall be submitted to the Contract Administrator, verifying that excess soil has been placed to the correct reuse site(s) for the quantity and the beneficial purpose identified in the excess soil reuse plan, as amended, for information purposes only. Amendments to the plan shall be identified in the report.

#### **180.10 BASIS OF PAYMENT**

Payment for the management of excess material shall be included in the tender items requiring such management and shall include all costs associated with acquiring approvals, releases, and agreements.

Payment for the management of excess material that is subject waste generated by the Contractor's operations and not listed in form OPSF 180-4 by the Owner, and is in addition to the cost of disposal as non-hazardous, solid industrial, or commercial waste, shall be paid as Extra Work, with provisions subject to testing to verify that the excess material is subject waste.

**Table 1  
Excess Material Management Conditions**

Excess Material Description	Subsection in This Specification				
	Conditions on Management by Re-Use	Conditions on Management as Disposable Fill	Conditions on Management by Open Burning	Conditions on Management by Disposal as Non-hazardous Solid Industrial or Commercial Waste	Conditions on Management by Stockpiling
Earth	Yes	Yes	n/a	Yes	Yes
Swamp Material	Yes	Yes Table 2	n/a	Yes	Yes Table 2
Aggregate	Yes	Yes	n/a	Yes	Yes
Rock	Yes	Yes	n/a	Yes	Yes
Bituminous Pavement	Yes Table 2	Not Permitted	n/a	Yes	Yes
Concrete	Yes Table 2	Not Permitted	n/a	Yes	Yes
Masonry	Yes Table 2	Not Permitted	n/a	Yes	Yes
Manufactured Wood	Yes	Not Permitted	Not Permitted	Yes	Yes Table 2
Natural Wood	Yes	Yes Table 2	Yes	Yes	Yes Table 2
Debris From Open Fires	n/a	Yes Table 2	n/a	Yes	Yes Table 2
Metal/Plastic Polystyrene Products	Yes	Not Permitted	Not Permitted	Yes	Yes
Subject Waste	Subject waste shall be managed as specified in the subsection for Conditions on Management by Disposal as Subject Waste.				
Materials Suspected of Being Contaminated	When excess materials that were not generated by the Contractor's operations and are not listed in form OPSF 180-4, Subject Waste Classification, are suspected of being contaminated, direction on their management shall be obtained from the Contract Administrator.				
Other Materials	Excess materials that are not listed above shall be managed as specified in the subsection for Conditions on Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste, unless prior alternative management conditions are approved in writing by the Ministry of Environment, Conservation and Parks.				

**Table 2**  
**Excess Material Management Distance Separation Requirements**

<b>Adjacent Feature</b>	<b>Minimum Distance Separation</b>
Ground Water	2 m (Above)
Waterbodies	30 m
Water Wells	100 m
Residences	100 m

## SITE SELECTION NOTIFICATION FOR STOCKPILING MATERIALS MANAGED THROUGH RE-USE

### Contract Information

Contract No: \_\_\_\_\_ Owner: \_\_\_\_\_

The following describes the notification process between the Owner of the Contract and the Contractor, wherein the Contractor formally notifies the Owner that agreement has been reached with a third party property owner for the stockpiling of Contract generated excess material. Such excess material, stockpiled for re-use or disposal, may be one or a combination of: earth; aggregate; swamp material; rock; concrete; masonry; bituminous pavement; natural wood; metal, plastic, and polystyrene; wood which has been treated, coated, or glued; and debris from open fires, provided the conditions on management are satisfied.

### Site Information

Registered Property Owner(s) for the subject property: \_\_\_\_\_

The subject property use description: \_\_\_\_\_

Lot \_\_\_\_\_, Concession \_\_\_\_\_, Township of \_\_\_\_\_

County/Region/District of \_\_\_\_\_

Quantity (tonnes/cubic metres) and Type of Excess Material stockpiled: \_\_\_\_\_

This is to notify you, as Owner, that permission has been obtained from the property owner(s) named herein for the management of excess materials through re-use from this Contract. The property owner has signed and been provided with a copy of this form and has been advised that the Site Selection Notification for Material Managed as Disposable Fill Form, OPSF 180-2 (for excess soil management), and a Property Owner's Release Form, OPSF 180-3, will also be required. The use of this management site will comply with the following:

### Conditions on Management

It is understood that materials are stockpiled to be re-used or held for disposal at a certified waste disposal site. Stockpiles of natural wood, manufactured wood, debris from open fires, and swamp material may only be located:

- a) A minimum of 2 m above the level of ground water.
- b) A minimum of 30 m from waterbodies.
- c) A minimum of 100 m from any water wells.
- d) A minimum of 100 m from residences.

Stockpiles of bituminous pavement, concrete, and masonry may only be located:

- a) A minimum of 30 m from waterbodies; and
- b) A minimum of 100 m from residences unless
  1. on property with a boundary common to a right-of-way, within the contract limits for a period not exceeding 120 calendar days, or
  2. such stockpiles are located within a provincial or municipal works yard or in a commercially licensed pit or quarry.

This form to be used with Ontario Provincial Standard Specification 180

I/We state that I/we are the registered owner(s) of the property identified above and I/we agree to sign the Property Owner's Release after the Contractor has placed the excess material on the above-noted property in accordance with the terms of this form.

These conditions do not supersede any constraints imposed on this property by Federal, Provincial or Municipal, including Conservation Authority, statute or regulations and bylaws made thereto.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Print Contractor's Name & Field Representative's Name

\_\_\_\_\_  
Contractor's Field Representative Signature

\_\_\_\_\_  
Print Registered Property Owner's Name (s)

\_\_\_\_\_  
Registered Property Owner's Signature(s)

cc: Contract Administrator, Property Owner(s), Contractor



## SITE SELECTION NOTIFICATION FOR MATERIAL MANAGED AS DISPOSABLE FILL

### Contract Information

Contract No: \_\_\_\_\_ Owner: \_\_\_\_\_

The following describes the notification process between the Owner of the Contract and the Contractor, wherein the Contractor formally notifies the Owner that agreement has been reached with a third-party property owner for the disposition of Contract generated excess material. Such excess material, managed as disposable fill, shall be limited to one or a combination of: earth, aggregate, swamp material, rock, natural wood, and debris from open fires, provided the conditions on management are satisfied.

### Site Information

Registered Property Owner(s) for the subject property: \_\_\_\_\_

The subject property use description: \_\_\_\_\_

Lot \_\_\_\_\_, Concession \_\_\_\_\_, Township of \_\_\_\_\_

County/Region/District of \_\_\_\_\_

Quantity (tonnes/cubic metres) and Type of Excess Material stockpiled: \_\_\_\_\_

### For Excess Soil Management

A description of the beneficial purpose for which the Excess Soil is to be reused at this site:

\_\_\_\_\_

The Excess Soil Quality Standards that apply to this site:

\_\_\_\_\_

Confirmation that Excess Soil Quality Standards applicable to this site align with the quality of excess soil to be brought to this site:

\_\_\_\_\_

This is to notify you, as Owner, that permission has been obtained from the property owner(s) named herein for the management of excess materials from this Contract. The property owner has signed and been provided with a copy of this form and has been advised that a Property Owner's Release Form, OPSF 180-3, will also be required. The use of this management site will comply with the following:

### Conditions on Management

Swamp material, natural wood, and debris from open fires managed as disposable fill will be top covered by a minimum of 300 mm of earth or topsoil. Swamp material, natural wood, and debris from open fires managed as disposable fill may only be placed:

- a) A minimum of 2 m above the level of ground water.
- b) A minimum of 30 m from waterbodies
- c) A minimum of 100 m from any water wells
- d) A minimum of 100 m from residences.

**Salt-Impacted Excess Soil may only be placed:**

- a) Where it is reasonable to expect that the soil will be affected by the same chemicals as a result of continued application of a substance for the safety of vehicular or pedestrian traffic under conditions of snow or ice; or
- b) With an industrial or commercial property use and to which non-potable water standards would be applicable; or
- c) That is at least 1.5 m below the surface of the soil.

**Salt-Impacted Excess Soil shall not be finally placed:**

- a) Within 30 m of a waterbody;
- b) Within 100 m of a potable water well or area with an intended property use that may require a potable water well; or
- c) In lands that will be used for growing crops or pasturing livestock unless the excess soil is placed 1.5 m or greater below the soil surface.

I/We state that I/we are the registered owner(s) of the property identified above and I/we agree to sign the attached form of Property Owner's Release after the Contractor has placed the excess material on the above-noted property in accordance with the terms of this form.

These conditions do not supersede any constraints imposed on this property by Federal, Provincial, or Municipal, including Conservation Authority, statute or regulations and bylaws made thereto.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Print Contractor's Name & Field Representative's Name

\_\_\_\_\_  
Contractor's Field Representative Signature

\_\_\_\_\_  
Print Property Owner's Name(s)

\_\_\_\_\_  
Registered Property Owner's Signature(s)

cc: Contract Administrator, Property Owner(s), Contractor

**PROPERTY OWNER'S RELEASE**

Contract No: \_\_\_\_\_

Work Description: \_\_\_\_\_

I/We \_\_\_\_\_ being the owner(s) of Lot, \_\_\_\_\_

Concession \_\_\_\_\_, Township of \_\_\_\_\_, and County/Region/District of \_\_\_\_\_, verify that the Contractor for the above noted work has placed excess material from the above noted Contract on my/our property with my/our permission. I/We have signed together with the Contractor forms OPSF 180-1, Site Selection Notification for Stockpiling Materials Managed Through Re-Use, or OPSF 180-2, Site Selection Notification for Material Managed as Disposable Fill, or both, that describe Conditions on Management, and have been assured by the Contractor that these conditions have been met.

Quantity (tonnes/cubic metres) and Type of Excess Material used as fill:

Where materials are managed as disposable fill, I/we agree to be responsible for any subsequent relocation and management of the material so placed.

Quantity (tonnes/cubic metres) and Type of Excess Material stockpiled:

Where materials are to be stockpiled, I/We agree that the stockpile(s) will be removed by the date(s) herein noted:

For materials managed as Excess Soil, the Quantity (tonnes/cubic metres) and the Identified Beneficial Purpose for which the Excess Soil was reused:

For Salt-Impacted Excess Soil, the Quantity (tonnes/cubic metres) and the Identified Beneficial Purpose for which the Excess Soil was reused:

I/We state that I/we are the registered owner(s) of the property identified above and I/we hereby release the Owner and the Contractor in respect of the activities of the Contractor carried out in accordance with this release.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Print Registered Property Owner's Name (s)

\_\_\_\_\_  
Registered Property Owner's Signature(s)

\_\_\_\_\_  
Print Contractor's Name & Field Representative's Name

\_\_\_\_\_  
Contractor's Field Representative Signature

cc: Contract Administrator, Property Owner(s), Contractor

### SUBJECT WASTE CLASSIFICATION

The following named waste is to be disposed of as a subject waste:

---

The classification of the above waste is as follows:

Shipping Name of Waste	
Reg. 347 Classification	
TDGA Identification No. (PIN)	
TDGA Classification	
TDGA Packaging Group	
Volume of Waste	
Container Type and Condition	

The following named waste is to be disposed of as a subject waste:

---

The classification of the above waste is as follows:

Shipping Name of Waste	
Reg. 347 Classification	
TDGA Identification No. (PIN)	
TDGA Classification	
TDGA Packaging Group	
Volume of Waste	
Container Type and Condition	

cc: Contract Administrator, Property Owner(s), Contractor

**WASTE QUANTITY REPORT**

For Solid Non-Hazardous Industrial and Commercial Waste

Contract No: \_\_\_\_\_

Contractor: \_\_\_\_\_

Material Description	Location of Disposal Site and Certificate of Approval Number	Quantity of Materials

cc: Contract Administrator, Property Owner(s), Contractor

### Excess Soil Quantity Report

For Excess Soil Managed by Stockpiling, Re-Use and as Disposable Fill

Contract No: \_\_\_\_\_ Progress Meeting Date: \_\_\_\_\_

Contract Description: \_\_\_\_\_

Contractor: \_\_\_\_\_

Print Name of Person Completing this Form: \_\_\_\_\_

Signature: \_\_\_\_\_

Date	Type of Placement S = Stockpiled D = Disposable Fill R = Beneficial Re-use	Location of Material Placement	Estimated Quantity of Material Placed (M <sup>3</sup> )	Site Selection Notification Submission Date (Form OPSF 180-1 or OPSF 180-2)	Property Owner's Release Submission Date (Form OPSF 180-3)
<b>Final Quantities</b>			<b>Stockpiled</b>	<b>m<sup>3</sup></b>	
			<b>Disposable Fill</b>	<b>m<sup>3</sup></b>	
			<b>Beneficial Re-use</b>	<b>m<sup>3</sup></b>	

Cc: Contract Administrator, Property Owner(s), Contractor

OPSF 180-6 (July 2021)

**Appendix 180-A, November 2021  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.**

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Property available for stockpiling for re-use and disposable of fill, or management as disposable fill of excess materials. (180.04.01.01)
- Forest resource licensees within the Contract limits. (180.04.01.03)
- Excess material audit or inventory when required. (180.04.01.06)
- Generic excess soil quality standards (Table 3). (10.04.01.8)
- Management conditions of materials with asbestos waste. (180.07.01)
- Identification of waterbodies and sensitive areas. (180.07.01)
- Management by re-use. (180.07.02)
- Management of disposable fill within the Owner's property and on other property. (180.07.03)
- Conditions on management by open burning. (180.07.04)
- Management by disposal of non-hazardous solid industrial or commercial waste. (180.07.05)
- Receiving sites. (180.07.05)
- Management by stockpiling within the Owner's property or on other property. (180.07.06)
- Management of dangerous good waste or subject waste. (180.07.07)

Clauses 180.04.01.01 and 180.04.01.08 require the use of OPSF 180-1 as a Site Selection Notification for Stockpiling Materials Managed Through Re-Use Form, and/or OPSF 180-2 as a Site Selection Notification for Material managed as Disposable Fill. Clause 180.04.01.01 requires the use of OPSF 180-3 as a Property Owner's Release Form. Clauses 180.04.01.05, 180.07.07, 180.10, and Table 1 require the use of OPSF 180-4 as a Subject Waste Classification Form. 180.04.01.02 requires the use of OPSF 180-5 as a Waste Quantity Report Form. Subsection 180.07.08 requires the use of OPSF 180-6 as an Excess Earth Quantity Report. If any form(s) other than OPSF 180-1, OPSF 180-2, OPSF 180-3, OPSF 180-4, OPSF 180-5, or OPSF 180-6 will be used for submission purposes, the alternate form(s) should be invoked by reference in the Contract Documents and the specification should be amended to remove reference to the OPSF(s).

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Table 3  
Generic Excess Soil Quality Standards**

<b>Township</b>	<b>Station (Offset)</b>	<b>Excavation Depth Range</b> <small>(Note 1)</small>	<b>Generic Excess Soil Quality Standard</b> <small>(Note 2)</small>	<b>Property Use</b> <small>(Note 3)</small>
*	*	*	*	*

**Notes:**

1. Depth as measured from the original ground surface.
2. Values refer to the table number in Appendix 1 of Rules for Soil Management and Excess Soil Quality Standards.
3. Values are acronyms coinciding with table headings in Appendix 1 of Rules for Soil Management and Excess Soil Quality Standards.  
 AO = Agricultural and Other Property Use,  
 RPIICC = Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use,  
 RPI = Residential/Parkland/Institutional Property Use,  
 ICC = Industrial/Commercial/Community Property Use,  
 (Surf) = Surface, and (Sub) = Subsurface.

Designer Fill-Ins for Table 3:

Fill in Table 3 based on information supplied by environmental project team members, or within an environmental or geotechnical report. When the appropriate soil quality standard is uncertain, specify the more restrictive standard.

Example Fill-Ins for Table 3:

<b>Township</b>	<b>Station (Offset)</b>	<b>Excavation Depth Range</b> <small>(Note 1)</small>	<b>Generic Excess Soil Quality Standard</b> <small>(Note 2)</small>	<b>Property Use</b> <small>(Note 3)</small>
Cameron	12+300 – 17+546		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Cameron	17+546 – 18+912	0 – 2.5 m	Table 3: Ceiling Values for Full Depth Excess Soil in a Non-Potable Ground Water Condition	RPI
Cameron	17+546 – 18+912	2.5 m – 7 m	Table 2.1: Ceiling Values for Full Depth Excess Soil in a Potable Ground Water Condition	ICC
Cameron	18+912 – 21+640		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Jacob	10+000 – 13+460		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Jacob	13+460 – 14+125 (2 m Lt – 14 m Rt)		Table 4.1: Ceiling Values for Stratified Excess Soil in a Potable Ground Water Condition	ICC (Sub)
Jacob	13+460 – 14+125 (12 m Lt – 2 m Lt)		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Jacob	14+125 – 19+567		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC



Example Fill-Ins for Table 3:

<b>Township</b>	<b>Station (Offset)</b>	<b>Excavation Depth Range</b> <small>(Note 1)</small>	<b>Generic Excess Soil Quality Standard</b> <small>(Note 2)</small>	<b>Property Use</b> <small>(Note 3)</small>
Entire Working Area			Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC

**Related Ontario Provincial Standard Drawings**

No information provided here.



**Note:** The MUNI implemented in April 2019 replaces OPSS 201 COMMON, November 2011 with no technical content changes.

**CONSTRUCTION SPECIFICATION FOR  
CLEARING, CLOSE CUT CLEARING, GRUBBING,  
AND REMOVAL OF SURFACE AND PILED BOULDERS**

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<b>201.10</b>	<b>BASIS OF PAYMENT</b>

**APPENDICES**

<b>201-A</b>	<b>Commentary</b>
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<b>201.01</b>	<b>SCOPE</b>
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This specification covers the requirements for the removal of trees, brush, bushes, stumps, windfalls, surface boulders, and piled boulders.

**201.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **201.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **201.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206 Grading

### **Ontario Government Publications**

Crown Forest Sustainability Act, 1994, S.O. 1994, c. 25

## **201.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Clearing** means the cutting of all standing trees, brush, bushes, and other vegetation to a maximum height of 300 mm above original ground level and the removal of felled materials and windfalls.

**Close Cut Clearing** means the cutting of all standing trees, stumps, brush, bushes, and other vegetation at original ground level and the removal of felled materials and windfalls.

**Grubbing** means the removal of all stumps, roots, embedded logs, debris, and secondary growth.

**Piled Boulders** means any cobbles, boulders, or rock fragments that have been placed in fencerows or piles.

**Rock** means rock as defined in OPSS 206.

**Surface Boulder** means any boulder or rock fragment that measures 200 mm or greater in any one dimension, extends a minimum of 200 mm above original ground, and can be removed without excavation.

**201.04 DESIGN AND SUBMISSION REQUIREMENTS**

**201.04.01 Submission Requirements**

**201.04.01.01 Crown Forest**

Crown forest, as defined by the Crown Forest Sustainability Act, shall not be cut until a permit has been obtained from the Ministry of Natural Resources and Forestry (MNR).

**201.07 CONSTRUCTION**

**201.07.01 General**

Trees measuring 150 mm or more in diameter, measured 1.0 m above ground, shall be cut, limbed, and stacked for collection by others. Cut trees shall not be stacked in or transported through areas identified as being environmentally sensitive in the Contract Documents or elsewhere by an Authority.

When specified in the Contract Documents, cut trees shall be stacked outside and adjacent to the right-of-way for the property owner, adjacent to and between the stations listed.

Within Crown Land areas specified in the Contract Documents for clearing and close cut clearing, marketable timber shall be made available for purchase from the Contractor to the holder of the sustainable forest licence. All cut and stacked trees shall be cut into lengths agreed to by the Contractor and the sustainable forest licence holder, but in no case exceeding 5.0 m.

All timber not purchased by others or stacked for adjacent landowners is excess material.

The work shall not damage or disturb the area outside the areas specified in the Contract Documents.

When work is done in or near waterbodies or waterbody banks, the work shall be according to the Contract Documents.

**201.07.02 Clearing**

The work shall consist of clearing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height, and any other areas specified in the Contract Documents.

**201.07.03 Close Cut Clearing**

The work shall consist of close cut clearing all earth surfaces to be covered by embankments greater than 1.2 m in height, and any other areas specified in the Contract Documents.

**201.07.04 Grubbing**

The work shall consist of grubbing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height, and any other areas specified in the Contract Documents.

Grubbing is not required in swamps.

Mechanical stump cutters are permitted, provided the entire root structure is removed.

Depressions remaining after grubbing shall be backfilled with suitable earth material and compacted to avoid settlement.

When clearing has been previously completed by others, all secondary growth, brush, and debris shall be removed.

Piled boulders and surface boulders that are not specified in the Contract Documents for removal and lie within areas to be grubbed shall be removed.

**201.07.05                      Removal of Surface Boulders and Removal of Piled Boulders**

The work shall consist of the removal of surface boulders and removal of piled boulders within the areas specified in the Contract Documents.

Depressions remaining after removal shall be backfilled with suitable earth material and compacted to avoid settlement.

**201.07.06                      Mechanical Stump Cutting**

The work shall consist of mechanical cutting of stumps to a depth of 150 mm below original grade, as specified in the Contract Documents.

**201.07.07                      Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**201.09                              MEASUREMENT FOR PAYMENT**

**201.09.01                      Actual Measurement**

Measurement shall be by area or by each, as specified in the Contract Documents.

**201.09.01.01                      Clearing, Close Cut Clearing, and Grubbing**

Measurement of clearing, close cut clearing, and grubbing shall be by area or by each, as specified in the Contract Documents.

**201.09.01.01.01                      By Area**

Removal shall be measured by area in a horizontal plane in hectares or square metres.

**201.09.01.01.02                      By Each**

For measurement purposes, a count shall be made of the trees or stumps removed.

**201.09.01.02                      Removal of Surface Boulders and Removal of Piled Boulders**

Removal shall be measured by area in a horizontal plane in hectares or square metres.

**201.09.01.03                      Mechanical Stump Cutting**

For measurement purposes, a count shall be made of the stumps removed by mechanical cutting.

**201.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**201.10 BASIS OF PAYMENT**

- 201.10.01 Clearing - Item**
- Close Cut Clearing - Item**
- Grubbing - Item**
- Removal of Surface Boulders - Item**
- Removal of Piled Boulders - Item**
- Mechanical Stump Cutting - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Areas designated for removal of piled boulders that lie within areas specified in the Contract Documents for either grubbing or removal of surface boulders shall be paid separately with no deduction from the grubbing or surface boulder removal item.

Removal of individual boulders that are 1 m<sup>3</sup> and greater in volume, shall be paid as rock excavation according to OPSS 206.

## **Appendix 201-A, April 2019 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Areas identified for clearing, close cut clearing, grubbing, removal of surface boulders and removal of piled boulders, and mechanical stump cutting, in addition to those areas required by this specification. (201.07)
- Areas identified as being environmentally sensitive. (201.07.01)
- Areas for clearing and close cut clearing within Crown Land. (201.07.01)
- Areas where cut trees are to be stacked. (201.07.01)
- The areas where work is to be done in or near waterbodies or waterbody banks. (201.07.01)
- Review crown land clearing with Ministry of Natural Resources and Forestry (MNRF) to determine volume of marketable timber available. (201.07.01)
- Identify holders of sustainable forest licences and their addresses from the MNRF and make them available to the Contractor. (201.07.01)
- Method of measurement for clearing, close cut clearing, and grubbing. (201.09.01.01)

When surface boulders and piled boulders are to be removed that are outside the general grading limits, the Removal of Surface Boulders and Removal of Piled Boulders items should be used.

Swamp excavation areas do not require grubbing, therefore, designers should not include a grubbing quantity in the Contract Documents for these areas.

The designer should include an additional quantity for individual boulders over 1 m<sup>3</sup> in the rock excavation quantity. (201.10.01)

Mechanical stump cutting should be considered to avoid damage to adjacent structures that may result from grubbing.

Piled boulders greater than 100 m<sup>3</sup> should be designated for removal and be included for payment in the tender item for Removal of Piled Boulders regardless of where they are located.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

### **Related Ontario Provincial Standard Drawings**

No information provided here.



**CONSTRUCTION SPECIFICATION FOR  
GRADING**

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<b>206.10</b>	<b>BASIS OF PAYMENT</b>

**APPENDICES**

<b>206-A</b>	<b>Commentary</b>
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**206.01 SCOPE**

This specification covers the requirements for grading, including earth and rock excavation and embankment construction, rock face, and the management of excavated materials.

**206.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.



## **206.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **206.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 201	Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders
OPSS 209	Embankments Over Swamps and Compressible Soils
OPSS 212	Borrow
OPSS 501	Compacting
OPSS 802	Topsoil
OPSS 804	Seed and Cover

### **Ontario Provincial Standard Specifications, Materials**

OPSS 1001	Aggregates - General
OPSS 1010	Aggregates - Base, Subbase, Select Subgrade and Backfill Material

### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:	
LS-706	Moisture-Density Relationship of Soils Using 2.5 kg Rammer and 305 mm Drop

## **206.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Angle of Repose** means the maximum angle measured from the horizontal at which fill remains stable.

**Backslope** means the slope in a cut between the invert of the roadside ditch and the point where the slope intersects original ground.

**Benching** means the keying into existing slopes by excavating horizontal planes. Benching also means the stepping of cut slopes at intermediate levels in deep cuts.

**Berm(s)** means an extension of an embankment constructed to a lower height and designed to provide road embankment stability.

**Bulking Factor** means the ratio of the volume of rock material following excavation, placement, and compacting to the original in situ volume of the same material. The bulking factor for rock shall be 1.35.

**Cushion Blasting** means the placing of a single row of lightly-loaded closely-spaced holes along the excavation limits as specified in the Contract Documents and firing them coincident with the main excavation blast as the last delay sequence to remove rock inside the cut limits.

**Ditching** means the excavation in earth or rock for all water courses. The term shall include roadside ditches, all excavation lying beyond the end of drainage structures, and stream and watercourse diversions and corrections.

**Earth** means all soils, except those defined as rock, and excludes stone masonry, concrete, and other manufactured materials.

**Embankment** means the material placed within the sideslopes; below the top of subgrade; and above the original ground, excavated base, or theoretical bottom, as applicable, to the limits as specified in the Contract Documents. Widening, flattening, or other placement of material adjacent to or on top of sideslopes beyond that specified in the Contract Documents is excluded.

**Existing Rock Surface** means either the rock surface that is exposed at ground level prior to the beginning of the Contract or the rock surface that is exposed after the overburden above it has been removed during the Contract.

**Frontslope** means the slope in a cut section between the edge of shoulder and the invert of the roadside ditch.

**Grubbing** means grubbing as defined in OPSS 201.

**Line Drilling** means the placing of a single row of very closely-spaced holes without explosives along the rock excavation limits as specified in the Contract Documents.

**Mucking** means the picking up of broken rock prior to haulage.

**Overbreak** means any broken, displaced, or loosened rock that originates outside the designated rock excavation limits as specified in the Contract Documents, regardless of whether that rock has been excavated, displaced, or loosened due to the inherent character of the rock formation itself or due to any other cause.

**Pre-Shearing** means the placing of a single row of closely-spaced lightly-loaded holes along the rock excavation limits as specified in the Contract Documents that are fired simultaneously before and independently of the main excavation blast. Pre-shearing is sometimes referred to as pre-splitting.

**Reclaimed Asphalt Pavement (RAP)** means RAP as defined in OPSS 1001.

**Reclaimed Concrete Material (RCM)** means RCM as defined in OPSS 1001.

**Roadside Ditch** means a ditch with one of its slopes coincident with the road frontslope.

**Rock** means natural beds or massive fragments of the hard, stable, cemented part of the earth's crust, either igneous, metamorphic, or sedimentary in origin that may or may not be weathered and includes boulders having a volume of 1 m<sup>3</sup> or greater.

**Rock Face** means the uniform, relatively planar, maintenance-free, vertical or near vertical rock surface between the top of the existing rock surface and the designated rock or ditch grade line that is generally characterized by noticeable drill hole traces and a minimum of blast-induced fractures beyond the rock excavation limits.

**Rock Surplus** means the rock excavation original tender quantity multiplied by the bulking factor, plus the volume of rock material excavated from all other items as specified in the Contract Documents, minus the rock embankment original tender quantity, minus shatter. Rock overbreak and rock materials resulting from scaling are specifically excluded.

**Scaling** means the removal of loose, broken, or overhanging rock fragments from an existing rock surface or the removal of loose, broken, or overhanging rock fragments from a rock face that remain in place after the rock has been blasted and mucked.

**Shale** means a fine-grained, low strength, sedimentary rock that undergoes rapid deterioration on exposure.

**Shatter** means fractured rock broken by the use of explosives or mechanical means and left in place.

**Sideslope** means the slope in a fill between the edge of shoulder and the point where the slope intersects original ground.

**Spall** means a rock fragment, chip, or splinter from a rock surface created by weathering, stress relief, blasting, or a combination thereof.

**Stripping** means the excavation of the upper layer of soil, that is predominantly organic, too soft, or wet and otherwise unsuitable for the construction of embankments that is done prior to and usually independent of earth excavation or the placement of fill materials or both.

**Tolerance** means a construction working tolerance only, that is considered to be:

a) Minus when it is:

- i. narrower than the Contract standard when pertaining to horizontal dimensions as measured from centreline, or
- ii. lower in elevation than the Contract standard when pertaining to vertical dimensions.

b) Plus when it is:

- i. wider than the Contract standard when pertaining to horizontal dimensions as measured from centreline, or
- ii. higher in elevation than the Contract standard when pertaining to vertical dimensions.

**Wall Control Blasting** means a blasting method using carefully spaced and aligned drill holes intended to produce a relatively flat, maintenance-free, rock surface or rock face as specified in the Contract Documents. Wall control blasting techniques are cushion blasting, line drilling, and pre-shearing.

## **206.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **206.04.01 Submission Requirements**

#### **206.04.01.01 Rock Material Management Plan (RMMP)**

When a RMMP is specified in the Contract Documents, for each construction stage, the following information shall be submitted to the Contract Administrator a minimum of 5 Business Days prior to commencement of the work for rock excavation or rock embankment:

- a) A plan for rock excavation corresponding to the station intervals as specified in the Contract Documents. The plan shall identify the volume in cubic metres of the following:
  - i. In-situ rock prior to blasting with shatter quantity shown separately.
  - ii. Excavated rock available calculated by applying the bulking factor to the quantity of in-situ rock prior to blasting, less the quantity of shatter.
  - iii. Excavated rock to be placed in rock embankment.
  - iv. Excavated rock within the Contract limits to be processed into granular material or other aggregates required in the Contract Documents.
  - v. Excavated rock to be used for other purposes in completing the Work, such as rock protection, rip rap, or river stone and descriptions and locations of that Work.
  - vi. Excavated rock not incorporated into the Work and the locations and uses of that material.
- b) A plan for the construction of rock embankments that identifies each location and volume in cubic metres where the material is going to be supplied to the corresponding station intervals as specified in the Contract Documents.
- c) The locations and volume in cubic metres where rock materials are to be obtained.
- d) The location and volume in cubic metres for each source when additional rock or granular material or both are required to complete the Work.
- e) The amount of rock surplus, if any, during the applicable construction stage.

The Contractor shall be solely responsible for the assumptions and the reasonableness of the RMMP.

In addition, an updated RMMP shall be submitted to the Contract Administrator, on a monthly basis, which shall include an ongoing tabulation of all rock materials that have been removed by the Contractor from the rock excavation or not incorporated in embankments, shown as a cumulative reduction in rock surplus.

#### **206.04.01.02 Trial Section for Modified Layer Compaction Method**

If the Contractor requests to use the modified layer compaction method, as specified in the Modified Layer Compaction Method clause, a detailed plan shall then be submitted in writing to the Contract Administrator a minimum of 48 hours prior to commencing any work on the required trial section. The plan shall include full details of the placing of material and its compaction, including layer thickness; number and type of compaction units and number of passes.

## **206.06 EQUIPMENT**

### **206.06.01 Tractor Bulldozer - Crawler Type for Rock Embankment Construction**

Tractor bulldozer, crawler type for rock embankment construction as specified in the Rock Embankments, General clause shall have a minimum net flywheel power of 200 kW.

**206.06.02                      Rollers for Shale Embankment Construction**

Pad foot drum roller required for the construction of shale embankments shall weigh a minimum of 18 tonnes and vibratory steel drum or pneumatic-tired rollers shall weigh a minimum of 9 tonnes.

**206.06.03                      Nuclear Moisture and Density Gauge**

Nuclear moisture and density gauges shall meet the requirements of the Nuclear Moisture and Density Gauge subsection of OPSS 501.

**206.06.04                      Hydraulic Excavator - Crawler Mounted for Rock Embankment Construction**

Hydraulic excavator, crawler mounted for rock embankment construction as specified in the Rock Embankments, General clause shall have a minimum operating weight of 32,000 kg.

**206.07                              CONSTRUCTION**

**206.07.01                        General**

**206.07.01.01                  Removal of Ice, Snow, and Frozen Ground**

The Contractor shall remove and dispose of all ice, snow, and frozen material from all earth, rock, or granular surfaces prior to placing fill and from all earth, rock, or granular materials being used for backfill, embankments, or any other construction purposes.

**206.07.01.02                  Compaction**

Earth and granular materials shall be compacted according to OPSS 501.

For compaction purposes, reclaimed asphalt pavement (RAP) or reclaimed concrete material (RCM) or both shall be treated as earth or rock respectively when such material is included in an earth embankment or a rock embankment.

**206.07.01.03                  Earth Borrow**

When earth borrow is specified in the Contract Documents, it shall be according to OPSS 212.

**206.07.01.04                  Tolerances - General**

In the event of a conflict between meeting horizontal grading tolerances and meeting vertical grading tolerances, the vertical grading tolerances shall take precedence.

**206.07.01.04.01              Tolerances for Earth**

Upon completion, all earth grade surfaces, excluding swamp excavations, shall be shaped to the grades and cross-sections as specified in the Contract Documents within the following tolerances:

a) Vertical grading tolerances for the finished earth subgrade within the limit of the roadway:

- + 30 mm
- 30 mm

b) Horizontal grading tolerances for the vertical faces of excavations to be backfilled:

+ 100 mm  
- 0 mm

c) Horizontal grading tolerances for ditch slopes, excluding roadside ditches:

+ 300 mm  
- 0 mm

Sideslopes beyond the plus tolerance may be accepted by the Contract Administrator when they are not detrimental to the work.

d) Vertical grading tolerances for all ditching in earth:

+ 30 mm  
- 30 mm

e) Horizontal grading tolerances for the backslopes in earth cut sections:

+ 300 mm  
- 300 mm

Backslopes beyond the plus tolerance may be accepted by the Contract Administrator when they are not detrimental to the work.

f) Horizontal grading tolerances for each sideslope in earth embankment construction:

+ 300 mm  
- 0 mm

g) Horizontal grading tolerances for roadside ditch frontslopes in earth cut sections:

+ 30 mm  
- 0 mm

Irrespective of compliance with the above tolerances, the completed slopes shall present a uniform appearance.

#### **206.07.01.04.02 Tolerances for Rock**

Completed rock grade surfaces shall be shaped to the grades and cross-sections as specified in the Contract Documents within the following tolerances:

a) Vertical grading tolerances for the finished rock subgrade within the limits of the roadway:

For cut sections:

+ 30 mm  
- 100 mm

For fill sections:

+ 30 mm  
- 75 mm

Excavation below the minus tolerances may be accepted by the Contract Administrator when it is not detrimental to the work and is brought up to grade as specified in the Rock Excavation, Grading clause.

b) Horizontal grading tolerances for vertical rock face cut limits:

+ 0 mm  
- 300 mm

Final faces beyond the plus tolerance may be accepted by the Contract Administrator when they are not detrimental to the work.

c) Horizontal grading tolerances for sloped rock face cut limits:

+ 300 mm  
- 300 mm

d) Horizontal grading tolerances for ditch slopes, excluding roadside ditches:

+ 300 mm  
- 0 mm

Excavation beyond the plus tolerance may be accepted by the Contract Administrator when the Owner deems it is not detrimental to the work or contribute to additional rock surplus.

e) Vertical grading tolerances for all ditching in rock cuts:

+ 30 mm  
- 30 mm

Excavation below the minus tolerance may be accepted by the Contract Administrator when it is not detrimental to the work.

f) Horizontal grading tolerances at the top of each sideslope of rock embankment construction:

+ 300 mm  
- 0 mm

## **206.07.02                      Drainage**

Excavation operations shall be performed in a manner to avoid water saturation of embankment material and roadway foundation material and to avoid leaving undrained pockets in excavations by providing effective drainage during all stages of the work.

In excavations below subgrade and in stripping operations when provision for surface drainage is impractical, backfill materials shall be placed as soon as possible following the excavation work.

Ditching required to provide for drainage of an embankment shall be completed in advance of the embankment construction. Ditches in roadway cuts shall be constructed as soon as possible to provide drainage from the cuts. Ditches located above and beyond roadway cuts shall be constructed prior to excavating adjacent cuts. When pipe subdrains are required in the bases of roadway cuts, such work shall be carried out at the time that the roadside ditches are being constructed.

**206.07.03                      Excavation and Grading**

**206.07.03.01                Earth Excavation - Grading**

**206.07.03.01.01         General**

The work shall include excavating, hauling, handling and placing, shaping, compacting, trimming of earth material, applying temporary cover, and the management of excavated and excess materials as specified in the Contract Documents.

The work shall also include the excavation and removal of pipes and culverts smaller than 200 mm in diameter and expanded polystyrene insulation when located within the limits of the earth excavation, grading work.

Suitable and non-excess earth material excavated from roadway cuts, ditching, and other associated sites shall be used in earth grading and embankment construction, unless otherwise specified in the Contract Documents.

**206.07.03.01.02         Stripping**

Except when swamp treatment is required, the original ground shall be stripped at the locations and to the depths specified elsewhere in the Contract Documents.

Material required for topsoil re-use shall be stockpiled according to OPSS 802 and as specified in the Contract Documents. Other material obtained from stripping shall be managed as specified in the Management of Excavated Materials clause.

**206.07.03.01.03         Excavation Below Subgrade**

Unsuitable materials, other than material excavated from swamps, shall be removed below the subgrade to the lengths, widths, and depths as specified in the Contract Documents. The resulting excavation shall be backfilled with material acceptable to the Contract Administrator and compacted according to OPSS 501.

**206.07.03.01.04         Swamp Excavation**

Swamp excavation shall be according to OPSS 209.

**206.07.03.01.05         Backfilling of Overexcavated Areas**

When overexcavation occurs, the overexcavated area shall be backfilled with granular material according to OPSS 1010 and compacted according to OPSS 501 at no additional cost the Owner. With the exception of frontslopes and when boulders are encountered in the excavated slopes, backfilling shall not be permitted to obtain the required slopes for excavations.

When boulders are encountered in the excavated slopes, the boulders shall be removed at the direction of the Contract Administrator and the resulting cavity or cavities shall be backfilled with granular material according to OPSS 1010 and compacted according to OPSS 501.

**206.07.03.02                Rock Excavation - General**

Except where shatter is required, drilling shall not be performed outside of or extend beyond the design excavation limits as specified in the Contract Documents.

The use of explosives for rock excavation shall be as specified in the Contract Documents.



All excavated rock, including rock materials resulting from overbreak and scaling, except the quantity of rock surplus, shall be placed in embankments.

Any excavated rock remaining after constructing the embankments shall be managed as specified in the Management of Excavated Materials clause.

#### **206.07.03.02.01          Rock Excavation - Grading**

The work shall include drilling and blasting to obtain the required rock excavation and shatter, mucking, and bringing to grade any overexcavation. Hauling shall only be part of the work when the excavated material is part of the rock surplus or is in excess of the rock embankment requirements.

When rock is to be excavated, all overlying stumps, roots, and vegetation shall be managed as excess material as specified in the Contract Documents. When earth overlies the rock to be excavated, the earth shall be removed. This work shall be performed sufficiently in advance of any blasting or rock excavation operations to allow rock cross-sections to be taken.

Scaling shall be carried out during mucking. All rock fragments or boulders either within or outside the excavated areas that are likely to slide or roll down rock cuts or are otherwise deemed to be unstable by the Contract Administrator shall be removed. Cut ditches shall be excavated at the same time as the main excavation.

Overexcavation in rock cuts shall be brought to grade within the specified tolerances with rock shatter or other approved material at no additional cost to the Owner.

Rock scaling and the removing of all overbreak and scaled materials shall be included in the rock excavation, grading item, unless a rock face item is included in the Contract Documents.

#### **206.07.03.02.01.01      Shale**

Shale shall be excavated using methods appropriate for the site conditions. Side slopes in shale shall be as specified in the Contract Documents. Rock face and subgrade shatter are not required in shale.

#### **206.07.03.02.02          Rock Face**

The work shall include drilling and blasting using one or more wall control blasting techniques to produce the rock face required in the Contract Documents and all associated scaling, mucking, hauling and management of all overbreak and scaled rock as specified in the Management of Excavated Materials clause.

The Contractor shall decide the required spacing, diameter, and loading of all drill holes for wall control blasting in order to ensure a uniform shear face between the holes and to meet the tolerance requirements stated in the Tolerances for Rock clause for rock face. In no case shall the diameter and spacing of these holes be more than 100 mm and 0.75 m centre-to-centre, respectively,

The Contractor shall also decide the required spacing, diameter, and loading of the adjacent line of production drill holes located inside the controlled blasting limits in order to ensure that wall control blasting is able to produce the required rock face.

However, in no case shall any portion of a production drill hole be within 0.75 m of the line formed by the drill holes for wall control blasting.

### **206.07.03.03 Excavation for Widening**

Excavation that is adjacent to the travelled portion of the roadway shall at no time be in advance of the backfilling operation by a distance greater than the limits as specified in the Contract Documents. Any such excavation shall be backfilled and compacted with material as specified in the Contract Documents, prior to closing down operations each day.

### **206.07.03.04 Excavation for Pavement Widening**

The work shall include excavating a trench adjacent to the existing pavement to the widths and depths as specified in the Contract Documents. Excavated material shall be spread on the adjacent shoulders and slopes.

### **206.07.03.05 Management of Excavated Materials**

Excavated materials shall be used within the Contract limits as specified in the Contract Documents.

When the Contract Administrator has deemed that the Contractor's sequence of operations, inadequate drainage measures, or handling processes or all have caused earth materials that were identified in the Contract Documents as being suitable for embankment or other construction purposes to become unsuitable for such purposes then, at no additional cost to the Owner, the Contractor shall either condition that material until it is suitable or manage it as excess material as specified in the Contract Documents and, if necessary, replace it with an equivalent volume of earth borrow. When the Contractor's operations have caused the material to become unsuitable due to excessive moisture content, conditioning may then involve re-working the material as necessary or spreading out the material in layers or both so that the material is thin enough to allow it to sufficiently dry out.

Quantities of unsuitable earth as specified in the Contract Documents and deemed suitable for use as earth fill by the Contract Administrator at the time of excavation shall be used to offset borrow quantities.

Rock excavated from within the right-of-way (ROW) may be used for aggregate production, in accordance with the RMMP.

Earth or rock that is surplus to embankment requirements may be placed adjacent to the embankments by widening embankments, flattening side slopes, or constructing Berms if optional cross sections or locations or both have been specified for such material in the Contract Documents or as requested by the Contractor and agreed to, in writing, by the Contract Administrator.

Surplus material may only be used within the Contract limits with the written consent of the Contract Administrator.

Surplus materials that cannot be accommodated as above and unsuitable materials shall be managed as excess material as specified in the Contract Documents.

### **206.07.03.06 Provision for Temporary Cover**

Cover used in temporary applications shall be applied according to OPSS 804 to areas as specified in the Contract Documents.

### **206.07.04 Embankments**

Only materials that are specified in the Contract Documents for use in embankments shall be used, unless approved by the Contract Administrator, in writing, prior to placement.

Materials shall not be placed over either frozen earth or ice surfaces. Ice, frozen earth, or other unsuitable materials shall not be incorporated into embankments.

RAP materials used in embankments shall be surplus to the recycling requirements of the Contract.

The Contractor shall notify the Contract Administrator, in writing, when an embankment has been completed to the dimensions that are as specified in the Contract Documents, at least 3 Business Days prior to the Contractor placing any topsoil or any other material on the embankment slopes.

#### **206.07.04.01 Earth Embankments**

##### **206.07.04.01.01 General**

Material for earth embankments shall be deposited and spread in uniform layers for the full width of the embankment, except as otherwise permitted for berms. Each layer shall be compacted prior to placing the succeeding layer. The lower portion of side hill or sloping sections shall be similarly constructed in layers and compacted until the full width surface of the specified cross-section is obtained. The embankment shall be completed thereafter with full width layers or as staged construction allows.

The construction of a core through the embankment and the subsequent completion of the embankment are prohibited, except when core construction is permitted in swamps according to OPSS 209.

Boulders, cobbles, and fragments of rock, RAP, and RCM over 150 mm in their maximum dimension shall not be placed within 300 mm of the surface of the earth grade.

Boulders, cobbles, and fragments of rock, RAP, and RCM up to 0.5 m<sup>3</sup> may be incorporated into an earth embankment provided:

- a) They are placed only in the bottom layer of the embankment.
- b) The maximum dimension of the largest particle shall not exceed 800 mm.
- c) They are not located within 300 mm of the final embankment side slopes.
- d) They are not located within 1.0 m of the surface of the earth grade.

Topsoil placed on earth embankments shall be according to OPSS 802.

Berms may be constructed separately, but shall be completed prior to building the road embankment to a higher level than the berm.

Any excavation necessary for establishing compaction results throughout any embankment or any trial areas such as the one described in the Modified Layer Compaction Method clause shall be done by hand and the excavated areas shall be backfilled with the same material or material otherwise acceptable to the Contract Administrator and properly re-compacted by the Contractor.

##### **206.07.04.01.02 Layer Compaction Method**

Earth embankments shall be built using the layer compaction method, unless otherwise specified in the Contract Documents or the requirements specified in the Modified Layer Compaction Method clause have been met.

In the layer compaction method, the embankment material shall be spread out in uniform full width layers not more than 300 mm in depth prior to compaction. Each layer shall be shaped and compacted to the line and cross-section as specified in the Contract Documents prior to the succeeding layer being placed.

All boulders, cobbles, fragments of rock, RAP, and RCM shall have a maximum vertical dimension after placement, not greater than the fully compacted layer depth.

When the ground cannot support construction equipment using this method then, at the discretion of the Contract Administrator, the first layer may be increased in thickness as specified in the Modified Layer Compaction Method clause.

#### **206.07.04.01.03 Modified Layer Compaction Method**

When it is impractical to use the layer compaction method, the modified layer compaction method may be used, at the discretion of and with the written consent of the Contract Administrator.

In this case, the embankment material shall be spread out in uniform full width layers not more than 600 mm in depth prior to compaction. Each layer shall be shaped and compacted to the line and cross-section specified prior to the succeeding layer being placed.

All boulders, cobbles, and fragments of rock shall have a maximum vertical dimension when placed not exceeding the modified layer depth. All RAP and RCM shall have a maximum vertical dimension after placement not exceeding 300 mm.

Prior to placing any material, the Contractor shall provide proof to the Contract Administrator of the ability of the proposed method to achieve the specified density by means of a trial section consisting of a single uniform lift covering a minimum area of 400 m<sup>2</sup> as specified in the Trial Section for Modified Layer Compaction Method clause. The location and extent of the trial section shall be acceptable to the Contract Administrator.

Prior to the construction of the trial section, the maximum dry density (MDD) of the material to be compacted shall be determined according to LS-706 from a minimum of 3 independent samples of the material.

Acceptance of the trial section shall be based on compaction testing within the trial section lift. For testing within the lift, the trial section shall be a single lot with 4 sublots of equal area. At a random location within each subplot, a level surface shall be prepared at a depth that permits the probe of a nuclear moisture and density gauge to extend to the bottom of the lift. Field wet density and moisture content shall be determined at each random location using the gauge and the dry density value calculated for each subplot.

If the quality index for the lot, calculated according to the Quality Index clause of OPSS 501, is equal to or greater than 1.47, the trial section shall be accepted. If the quality index for the lot is less than 1.47, the method of construction of the trial section shall not be accepted. The target density for the purpose of the quality index calculation shall be the average of the 3 MDD values determined according to LS-706.

If the trial section has been accepted, field wet density and moisture content testing shall be carried out at 10 random locations on the trial section surface using a nuclear moisture and density gauge. The average dry density from the 10 locations shall be calculated and used as the target density for acceptance, according to OPSS 501, for further placement of the material by the modified layer compaction method.

The same procedure used for the construction of the accepted trial section, including compaction equipment, vibration characteristics, and number of passes, shall be used for the further placement and compaction of the same material by the modified layer compaction method.

A new trial section shall be required for the material when one or more of the following apply:

- a) A new target density is required according to the Target Density clause of OPSS 501.
- b) The Contractor wants to change the accepted modified layer compaction method procedure.
- c) An accepted modified layer compaction method procedure is no longer producing the required degree of compaction.

When requested by the Contract Administrator, compacted material shall be removed to verify the thickness and/or complete compaction testing on a levelled surface within any compacted lift.

All excavation, backfilling, and re-compaction necessary for thickness verification and compaction testing within the trial section lift and as requested by the Contract Administrator at other locations shall be completed to the satisfaction of the Contract Administrator at no additional cost.

#### **206.07.04.02            Rock Embankments**

##### **206.07.04.02.01        General**

The work shall include hauling, placement, and compaction of excavated rock.

Excavated rock used to construct rock embankments shall be obtained from within the Contract limits. If there is insufficient material to complete the rock embankments, the additional material shall then be provided and paid for under the rock borrow item.

All rock from other items as specified in Contract Documents shall be used to construct rock embankments.

Rock embankments shall be constructed by placing embankment materials full width in successive uniform layers.

For rock embankments, other than shale, the layers shall not exceed 1.5 m in thickness prior to compaction. The material in each layer shall be fully compacted before the succeeding layer is placed. Each rock fill layer shall be compacted with a tractor bulldozer, crawler type, as specified in the Tractor Bulldozer - Crawler Type for Rock Embankment Construction subsection. In confined areas or in any other areas where the Contract Administrator agrees that a tractor bulldozer, crawler type, cannot be reasonably used, then each rock fill layer may be compacted using a hydraulic excavator, crawler mounted, as specified in the Hydraulic Excavator - Crawler Mounted for Rock Embankment Construction subsection. The minimum number of complete passes shall be six and the maximum number of passes shall be eight for either type of equipment. A complete pass shall be defined as 100% coverage of the layer surface. The maximum speed of the equipment during each pass shall be 3.2 km/h.

For all rock embankments, materials shall be placed in their final position by blading when using a tractor bulldozer, crawler type for or by raking and chinking when using a hydraulic excavator, crawler mounted or a combination of both types of equipment, providing that the total number of complete passes over the same area specified in the paragraph given above is achieved. End dumping or depositing of rock over the end of any layer by hauling equipment is not permitted, except as otherwise noted below. Each layer shall be levelled in place and compacted to minimize voids and bridging of large rock fragments within the embankment.

Rock fragments exceeding a maximum of 1.0 m in any dimension shall be well distributed throughout the embankment. Rock fragments up to a maximum of 3.0 m in any dimension may be incorporated into the embankment, provided that the rock fragments are less than two-thirds the remaining embankment height when measured from the bottom of the oversized rock fragment at the point of placement to the top of the rock embankment, and shall be sufficiently spaced to allow free access of the specified equipment to compact the intervening fill.

Placement and compaction in layers is not required when rock is placed under water. In this case, end dumping may be used. However, end dumping shall only be used to an elevation of 1.0 m above the water level that is present at the time of placement. After that, the rock embankment shall be constructed using the equipment and method specified in the paragraphs above. The materials shall be well distributed to form a solid embankment constructed to full width as the work progresses or as staged construction allows.

When a rock embankment is constructed in a wet area such as swamps with full, partial, or no excavation, the direction of the rock placement shall be so that mud waves generated by the rock placement are able to move away from the embankment. Mud waves shall be displaced or removed to prevent their entrapment below or within the embankment.

End dumping from the top of the embankments may also be carried out at locations as specified in the Contract Documents when narrow and relatively shallow widening of an existing embankment is required for the shoulder portion of the highway.

The top surface of the embankment shall be chinked with rock fragments and spalls to form the subgrade prior to the placement of the roadway subbase in order to minimize voids and prevent migration of the subbase material into the rock fill.

Care shall be taken to avoid large boulders and rock fragments protruding above the average embankment surface within a distance of 3.0 m beyond the edge of shoulder.

With the written approval of the Contract Administrator, dumping of surplus rock over the sides of rock embankments by the Contractor is permitted as follows:

- a) After the rock embankments have been completed to the grades and tolerances specified in the Contract Documents and all such measurements have been verified by the Contract Administrator.
- b) Only in areas that do not affect features that are located within the right-of-way (e.g., ditches, culverts, and signs) or the right-of-way limits and shall not detrimentally affect stability or drainage or cause other potentially negative impacts.

In other areas at the discretion of the Contract Administrator.

#### **206.07.04.02.02            Shale Embankments**

Shale embankment materials shall be deposited and spread in uniform layers for the full width of the embankment. Layers shall not exceed 450 mm in thickness prior to compaction. When a harder, more durable rock (e.g., limestone) is present as an integral part of a shale formation, no pieces shall be placed in the embankment that after placement are greater than 150 mm measured vertically or greater than 600 mm measured parallel to the embankment layers, respectively.

Compaction of each layer shall be in two stages using equipment specified in the Rollers for Shale Embankment Construction subsection. In the first stage, a minimum of 2 passes shall be made with a static sheepsfoot, packall, padfoot, or tamping foot type roller. In the second stage, a minimum of 2 passes shall be made with a vibratory steel drum or pneumatic-tired roller. The maximum speed of rollers shall not exceed 5 km/hr.

#### **206.07.05                    Rock Backfill to Structure**

When rock backfill to structures is specified, the rock backfill shall only be comprised of rock fragments with maximum dimensions no larger than 250 mm and free of all debris, earth, topsoil, wood, chemical, or other contamination.

Rock backfill shall be placed in a manner that the structure is not damaged. Dumping of rock backfill against a structure shall not be permitted.

**206.07.06                      Quality Control**

**206.07.06.01                  Grade Checks**

The Contractor shall be responsible for carrying out all quality control (QC) grade checks to ensure that horizontal and vertical grading tolerances are met.

A competent surveyor shall carry out grade checks on all finished earth and rock grade surfaces. QC of earth and rock grade surfaces shall be based on horizontal and vertical grading tolerances as specified in the Tolerances for Earth and Tolerances for Rock clauses, respectively. The grade shall be certified at the stations and offsets shown in the grading templates or where grading templates are not available, at the frequency requirements specified for the layout elsewhere in the Contract Documents.

**206.07.06.01.01              Submission of Grade Checks**

The Contractor shall submit all grade checks relating to horizontal and vertical grading tolerances, including all non-compliances, to the Contract Administrator within 2 Business Days following completion of the grade.

When a digital terrain model is available, the Contractor has the option to provide the grade checks in the same format accompanied with a signed cover letter certifying that the components of the work indicated on the digital terrain model have been correctly constructed to the specified line and grade tolerances.

Alternatively when grading templates are available, the Contractor shall sign and certify on the grading template that the components of the work indicated on that template have been correctly constructed to the specified line and grade tolerances.

If a digital terrain model or template is not available, then the Contractor shall complete, sign, and submit the attached form OPSF 206-1 to the Contract Administrator.

**206.07.06.02                  Compaction Quality Control**

The Contractor shall use Method B according to OPSS 501 for quality control of compaction.

**206.07.07                      Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**206.08                          QUALITY ASSURANCE**

**206.08.01                      Grade Checks**

The Owner may conduct random QA grade checks to verify horizontal and vertical grading tolerances.

Provided that the Owner's grade checks conform to those submitted by the Contractor, no action shall be taken. If discrepancies between QA and QC grade checks occur, the Owner may then conduct additional QA grade checks at the Owner's discretion.

If the finished grade or cross-section is found to be outside the specification limits specified in the Tolerances - General clause, then:

- a) The Contract Administrator shall notify the Contractor.
- b) The Contractor shall then bring the earth or rock grade surface to within the specified tolerances for grade, at no additional cost to the Owner.

**206.09 MEASUREMENT FOR PAYMENT**

**206.09.01 Actual Measurement**

**206.09.01.01 Earth Excavation, Grading**

Measurement for earth excavation, grading, shall be the in-place volume of earth in cubic metres computed from field measurements of cross-sections taken both prior to grubbing and upon completion of the work.

When benching is required to key-in new fills into existing slopes, the quantity of materials that are excavated as part of that operation shall not be included in the measurement for payment.

**206.09.01.01.01 Overbuilding, Earth**

When the Contract requires earth borrow, the quantity of material placed beyond the earth grading tolerances shall be deducted from the measured quantity of earth borrow on a cubic metre for cubic metre basis, with no correction for changes in the density of the material.

**206.09.01.02 Excavation for Pavement Widening**

Measurement of excavation for pavement widening shall be the horizontal length in metres along each edge of the existing pavement when widening is specified in the Contract Documents.

**206.09.01.03 Rock Excavation, Grading**

**206.09.01.03.01 General**

Measurement of rock excavation, grading, shall be the in-place volume in cubic metres computed from field measurements of cross-sections bounded by the original rock line after the earth overburden has been removed and the theoretical rock face and the bottom excavation limits designated in the Contract Documents. Where shatter is specified, the bottom of the cut shall be 300 mm below the designated rock grade.

The quantity of rock excavation shall also include:

- a) All shatter that is specified in the Contract Documents.
- b) Any rock that is excavated beyond the limits that are as specified in the Contract Documents at the Contract Administrator's written instructions.

**206.09.01.03.02 Overbuilding, Rock**

Where the Contract requires borrow, the quantity of material placed beyond the rock grading tolerance at the top of subgrade and beyond the angle of repose for rock fills, below the subgrade, shall be deducted from the measured quantity of borrow on a cubic metre for cubic metre basis, with no correction for changes in density of the material.

**206.09.01.03.03 Boulders**

Measurement of each boulder classified as rock shall be by volume in cubic metres computed on the basis of the product of the actual rock measurement of the 3 maximum rectilinear dimensions in metres of the boulder.

**206.09.01.04 Rock Face**

Measurement of rock face shall be by area of the rock face in square metres.



**206.09.01.05                    Rock Embankment**

Measurement of rock embankment shall be by volume in cubic metres of rock embankments. Adjustments to the Plan Quantity shall be limited to those supported with topographic survey information.

**206.09.02                    Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**206.10                    BASIS OF PAYMENT**

**206.10.01                    Earth Excavation, Grading - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

Payment for earth grade checks, including provision of all labour, Equipment, and Material to conduct quality control testing shall be included in the Contract price as part of the work of earth excavation, grading.

**206.10.02                    Excavation for Pavement Widening - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract Administrator directs that material excavated under this item is to be handled other than as specified in the Excavation for Pavement Widening clause, then such material shall be managed in accordance with the Contract Documents and treated as a Change in the Work.

Material used to backfill the excavation shall be paid for at the Contract price for the tender item of the type of material used.

**206.10.03                    Rock Excavation, Grading - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When a rock face item is not included in the Contract, rock scaling and the removing of all overbreak and scaled materials shall be included in the rock excavation, grading item.

When a rock embankment item is not included in the Contract, the work of rock embankment shall be included in the rock excavation, grading item.

When excavated rock is to be used for any other Contract item work (e.g., rock embankment, granular materials, or rip-rap), the hauling costs are deemed to be included in payment for the work associated with the appropriate tender item. However, when excavated rock is not to be used for any other Contract item work, the hauling costs are then deemed to be included in payment for the work under the rock excavation, grading item.

Payment for rock grade checks, including provision of all labour, Equipment, and Material to conduct quality control testing, shall be included in the Contract price as part of the work of rock excavation, grading.

When drilling, blasting, and mucking are required as a part of the work for this tender item, the following progress payments shall be made:

- a) 33% of the progress volume for drilling.
- b) 33% of the progress volume for blasting.

**206.10.04                      Rock Face - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

On completion of drilling and blasting, a progress payment of 50% of this tender item shall be made.

On completion of mucking, a progress payment of an additional 25% of this tender item shall be made.

When the Contract does not contain a separate tender item for rock face, the Contract price for rock excavation, grading, shall include full compensation for all labour, Equipment, and Material to do the work of rock face.

**206.10.05                      Rock Embankment - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract does not contain a separate tender item for rock embankment, the Contract price for rock excavation, grading shall include full compensation for all labour, Equipment, and Material to do the work of rock embankment.

**206.10.06                      Backfill for Overexcavation**

Payment shall not be made for backfill of any overexcavation in excess of the specified tolerances.

**206.10.07                      Backfill for Subexcavation**

Material used to backfill subexcavations and transition or grade point treatments shall be paid for at the Contract price for the tender item of material used.

**206.10.08                      Rock Borrow**

When the Contract does not contain sufficient rock within the Contract limits and the Contract does not contain a rock embankment item, rock borrow shall be paid according to OPSS 212.



## **Appendix 206-A, April 2019 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

Consider using OPSS.PROV 206 when rock excavation volumes is in excess of 10,000m<sup>3</sup>.

The designer should specify the following in the Contract Documents:

- Locations for use of excavated material. (206.07.03.05)
- Areas requiring temporary cover. (206.07.03.06)
- Location and extent of unsuitable material below subgrade to be removed. (206.07.03.01.03)
- The stripping limits. (206.07.03.01.02)
- The maximum limit of open excavation allowed adjacent to the travelled roadway. (206.07.03.03)
- The widths and depths when excavation is required adjacent to the travelled roadway. (206.07.03.04)

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- Rock material management plan. (206.04.01.01)
- Borrow requirements. (206.07.01.03)
- Rock face item. (206.07.03.02.02)
- Rock embankment item. (206.10.05)
- Where the Modified Layer Compaction Method may be used. (206.07.04.01.03)
- Location of where end dumping material is allowed. (206.07.04.02.01)

The designer should be aware that in estimating fill quantities, where displacement may be anticipated, an allowance should be made for losses into bottom of fills in material due to displacement.

Consideration should be given to the use of trial blast over a limited extent to ensure that the method spacing and diameter wall control blast holes are properly selected to achieve an acceptable rock face for the given rock condition.

On reconstruction projects, areas of subgrade shatter, rock fill, and previously blasted rock to be removed should be clearly defined in terms of location, depth, etc.

When a rock embankment item is not included in the Contract, the designer should include a rock borrow item if there is insufficient rock within the Contract limits.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

## Appendix 206-A

### Related Ontario Provincial Standard Drawings

OPSD 200.010	Earth/Shale Grading, Undivided Rural
OPSD 200.020	Earth/Shale Grading, Divided Rural
OPSD 201.010	Rock Grading, Undivided Rural
OPSD 201.020	Rock Grading, Divided Rural
OPSD 202.010	Slope Flattening Using Excess Material on Earth or Rock Embankment
OPSD 202.020	Drainage Gap for Slope Flattening on Rock or Granular Embankment
OPSD 202.030	Embankment Widening for Guide Rail End Treatments and Transitions
OPSD 203.010	Embankments Over Swamp, New Construction
OPSD 203.020	Embankments Over Swamp, Existing Slope Excavated to 1H:1V
OPSD 203.030	Embankments Over Swamp, Existing Slopes Maintained
OPSD 203.040	Embankments Over Swamp at Pipe Culverts $\leq 1500\text{mm}$
OPSD 204.010	Boulder Treatment, Cut Sections - Subgrade
OPSD 205.010	Transition Treatment, Earth Cut to Earth Fill
OPSD 205.020	Transition Treatment, Rock Cut to Rock Fill
OPSD 205.030	Transition Treatment, Rock Cut to Earth Fill
OPSD 205.040	Transition Treatment, Earth Fill to Rock Fill and Earth Fill to Granular Fill
OPSD 205.050	Transition Treatment, Rock Cut to Earth Cut
OPSD 205.060	Frost Heave Treatment
OPSD 208.010	Benching of Earth Slopes
OPSD 209.010	Rural Pavement Widening
OPSD 209.011	Rural Pavement Widening with Curb and Gutter
OPSD 209.020	Widening, Existing Rock Cut with Grade Raise
OPSD 300.010	Side Road Intersection, Fill
OPSD 300.020	Side Road Intersection, Cut
OPSD 301.010	Rural Entrances to Roads on Fill
OPSD 301.020	Rural Entrances to Roads in Earth Cut With Culvert Installation
OPSD 301.030	Rural Entrance, Rock Cut



**CONSTRUCTION SPECIFICATION FOR  
TRENCHING, BACKFILLING, AND COMPACTING**

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**401.01 SCOPE**

This specification covers the requirements for excavating, backfilling, and compacting trenches for the installation of pipe, end sections, and associated appurtenances.

**401.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **401.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **401.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206	Grading
OPSS 403	Rock Excavation for Pipelines, Utilities, and Associated Structures in Open Cut
OPSS 404	Support Systems
OPSS 412	Sewage Forcemain Installation in Open Cut
OPSS 441	Watermain Installation in Open Cut
OPSS 490	Site Preparation for Pipelines, Utilities, and Associated Structures
OPSS 491	Preservation, Protection, and Reconstruction of Existing Facilities
OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 501	Compacting
OPSS 510	Removal
OPSS 517	Dewatering for Excavations
OPSS 539	Temporary Protection Systems
OPSS 902	Excavating and Backfilling - Structures

### **Ontario Provincial Standard Specifications, Material**

OPSS 1010	Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
OPSS 1359	Unshrinkable Backfill

### **Provincial Statute**

O. Reg. 213/91	Construction Projects
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For the purpose of this specification, the following definitions apply:

**Associated Appurtenances** means as defined in OPSS 412 and OPSS 441.

**Backfilling** means the operation of filling the trench with bedding, cover, and backfill material or embedment and backfill material.

**Backfill Material** means fill material used above the embedment or cover material and below the lower of the subgrade or finished grade or the original ground.

**Bedding Class** means a classification system that defines the depth of the bedding material.

**Bedding Material** means material as it relates to rigid pipe, from the bottom of the trench to the bottom of the cover.

**Cover Material** means the material placed from the top of the bedding to the bottom of the backfill for rigid pipe.

**Deleterious Material** means materials from the recycling stream other than glass, ceramic, reclaimed asphalt pavement, and reclaimed concrete materials that includes but is not limited to the following: wood, clay brick, clay tile, plastic, gypsum, gypsum plaster, and wallboard.

**Embedment Material** means material as it relates to flexible pipe, from the bottom of the trench to the bottom of the backfill.

**Excavation, Earth and Rock** means the excavation classified as earth and rock according to OPSS 206.

**Extra Excavation** means all excavation ordered in writing by the Contract Administrator beyond excavation as specified in the Contract Documents.

**Flexible Pipe** means pipe that can deflect 2% or more without cracking such as polyvinyl chloride, polyethylene, or steel pipe.

**Imported Material** means material obtained from a source other than the Working Area.

**Native Material** means the material removed to form an excavation within the Working Area for return to the same or other excavation.

**Pipe** means sanitary or storm pipe sewers, watermains, forcemains, pipe culverts, and subdrains.

**Rigid Pipe** means pipe that cannot deflect more than 2% without cracking such as concrete pipe.

**Trench** means as defined in O. Reg 213/91.

**Trenching** means the earth or rock excavation required to construct a trench in which to install pipes and their associated appurtenances.

**Trench Width** means the horizontal distance between the trench walls as measured at the bedding grade.

**Unshrinkable Fill** means as defined in OPSS 1359.



**401.05 MATERIALS**

**401.05.01 Bedding Material and Embedment Material**

Bedding and embedment materials shall be one of the following, or as specified in the Contract Documents:

- a) Granular A.
- b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.
- c) Unshrinkable fill.

**401.05.02 Cover Material**

Cover material shall be one of the following, or as specified in the Contract Documents:

- a) Granular A.
- b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.

**401.05.03 Granular Material**

Granular material shall be according to OPSS 1010.

**401.05.04 Backfill Material**

**401.05.04.01 General**

Backfill material shall be one of the following, or as specified in the Contract Documents:

- a) Granular A.
- b) Granular B, Type I, II, or III.
- c) Unshrinkable fill.
- d) Native material.

**401.05.04.02 Native and Imported Material**

Only native and imported material approved by the Contract Administrator shall be used. All material shall be free from frozen lumps, cinders, ashes, organic matter, rocks and boulders over 150 mm in any dimension, and other deleterious material.

**401.05.05 Unshrinkable Fill**

Unshrinkable fill shall be according to OPSS 1359.

**401.07 CONSTRUCTION**

**401.07.01 General**

Trenches shall be stable and dry, unless designated by the Contract Administrator as subaqueous Work.

**401.07.02 Site Preparation**

Site preparation shall be according to OPSS 490.

**401.07.03 Preservation and Protection of Existing Facilities**

Preservation and protection of existing facilities shall be according to OPSS 491.

**401.07.04 Removals**

Removals shall be according to OPSS 510.

**401.07.05 Dewatering**

Dewatering shall be according to OPSS 517 for placement of pipe or to OPSS 902 for placement of structures.

**401.07.06 Support Systems**

Support systems shall be according to OPSS 404.

**401.07.07 Temporary Protection Systems**

The construction of all temporary protection systems shall be according to OPSS 539. When the stability, safety, or function of an existing roadway, railway, other works, or proposed works may be impaired due to the method of operation, appropriate protection shall be provided. Protection may include sheathing, shoring, and the driving of piles, when necessary.

**401.07.08 Removal of Frozen Ground**

Written permission shall be obtained from the Contract Administrator prior to starting any excavation in frozen ground. The method used for removal of frozen ground shall not cause damage to adjacent structures or Utilities.

**401.07.09 Trenching**

Trenches shall be excavated to the lines, grades, and dimensions specified in the Contract Documents. The width of the trench at the bottom shall not exceed the width at the top.

Trenching for pipe culverts shall include the excavation for frost tapers and end sections.

No more than 15 m of trench shall be open in advance of the completed pipe system.

The Contract Administrator shall be notified immediately if the bottom of the trench appears to give an unsuitable foundation.

When installing rigid pipe, if the trench is excavated wider than the allowable width without authorization, the Contract Administrator may require the use of a stronger pipe or a higher bedding class or both.

If the trench depth is excavated beyond the limits of the required excavation without the Contract Administrator's authorization, granular material shall be placed and compacted in the trench to reinstate the required trench limits prior to backfilling the trench as specified in the Contract Documents. Alternatively, another structurally accepted design shall be provided by adjusting the limits of the excavation prior to backfilling.

Rock excavation for trenches shall be according to OPSS 403.

## **401.07.10 Backfilling and Compacting**

### **401.07.10.01 General**

Allowable deflection in diameter of flexible pipe during cover and backfill operations shall be as per manufacturer's recommendations.

Compacting of embedment, bedding, cover, and backfill materials during pipe installation shall be according to OPSS 501.

Prior to allowing the movement of any construction equipment or vehicular traffic over the buried infrastructure, the depth of backfill shall be sufficient enough to protect the buried infrastructure from damage.

### **401.07.10.02 Embedment**

Placement of embedment material shall be as described in the Bedding and Cover clauses.

### **401.07.10.03 Bedding**

Pipe bedding shall be of the class as specified in the Contract Documents.

The surface upon which the pipe is to be laid shall be true to grade and alignment.

The pipe bedding shall be shaped to the dimensions specified in the Contract Documents. When bell and spigot pipe is to be laid, recesses shall be shaped to receive the bells.

Bedding material placed in the haunches shall be compacted prior to continued placement of cover material.

Bedding material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Bedding material shall be placed on each side of the pipe and shall be completed simultaneously. At no time shall the levels on each side differ by more than the 200 mm uncompacted layer.

### **401.07.10.04 Cover**

Cover material shall be placed so that damage to or movement of the pipe is avoided.

Cover material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Cover material shall be placed on each side of the pipe and shall be completed simultaneously. At no time shall the levels on each side differ by more than the 200 mm uncompacted layer.

### **401.07.10.05 Backfill**

Backfill material shall be placed in uniform layers not exceeding 300 mm in thickness, loose measurement, for the full width of the trench and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Power operated tractors or rolling equipment shall not be used for compacting until backfill material has been placed to a minimum depth of 900 mm above the crown of the pipe. Uniform layers of backfill material exceeding 300 mm in thickness may be placed with the approval of the Contract Administrator.

**401.07.11 Extra Trenching, Backfilling, and Compacting**

Extra trenching, backfilling, and compacting shall be as described in the Trenching and Backfilling and Compacting subsections.

Unsuitable material shall be excavated and the resulting excavation shall be backfilled and compacted to obtain a suitable foundation.

**401.07.12 Site Restoration**

Site restoration shall be according to OPSS 492.

**401.07.13 Management of Excess Material**

Management of excess material shall be as specified in the Contract Documents.

**401.09 MEASUREMENT FOR PAYMENT**

**401.09.01 Actual Measurement**

**401.09.01.01 Extra Trenching, Backfilling, and Compacting**

Extra trenching, backfilling, and compacting shall be based on the volume of the extra excavation measured in cubic metres prior to installation of the pipe.

The volume of the excavation that is in addition to the limits specified in the Contract Documents shall be determined.

**401.10 BASIS OF PAYMENT**

**401.10.01 Trenching, Backfilling, and Compacting**

Payment at the Contract price for the appropriate tender items for the installation of pipe, end sections, and associated appurtenances, shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

Any expenses for remedial work resulting from unauthorized over-excavation of the trench width and depth shall be at no additional cost to the Owner.

When native material is deemed unsuitable for backfill for reasons other than those attributed to the Contractor's mode of operation, any extra work done to provide acceptable backfill beyond the work herein specified shall be paid for as Extra Work.

**401.10.02 Extra Trenching, Backfilling, and Compacting - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

**401.10.03 Rock Excavation for Trenches**

Payment for rock excavation for trenches shall be according to OPSS 403.

## **Appendix 401-A, November 2021 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

The designer may consider including soil boring data, a geotechnical report, a subsurface report, or a soils report in the tender documents.

The designer may consider specifying requirements for a pre-condition survey in the Contract Documents.

The designer should specify the following in the Contract Documents:

- Extra excavation. (401.03)
- Type of embedment material. (401.05.01)
- Type of bedding material. (401.05.01)
- Type of cover material. Unshrinkable fill or native material may be a consideration in the cover (401.05.02)
- Type of backfill material. (401.05.04.01)
- Trench line, grade, and dimensions. (401.07.09)
- Pipe bedding class and dimensions. (401.07.10.03)
- Volume of the excavation that is in addition to the limits. (401.09.01.01)

For utilities, the designer should reference their respective trenching, backfilling, and compaction details.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

### **Related Ontario Provincial Standard Drawings**

OPSD 802.010	Flexible Pipe Embedment and Backfill, Earth Excavation
OPSD 802.013	Flexible Pipe Embedment and Backfill, Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.020	Flexible Pipe Arch Embedment and Backfill, Earth Excavation
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill, Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.030	Rigid Pipe Bedding, Cover and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.031	Rigid Pipe Bedding, Cover and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.032	Rigid Pipe Bedding, Cover and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.033	Rigid Pipe Bedding, Cover and Backfill, Rock Excavation
OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 802.050	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.051	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.052	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Rock Excavation

OPSD 802.054 Horizontal Elliptical Rigid Pipe Bedding and Cover in Embankment, Original Ground:  
Earth or Rock  
OPSD 803.010 Backfill and Cover for Concrete Culverts  
OPSD 803.030 Frost Treatment - Pipe Culverts, Frost Penetration Line Below Bedding Grade  
OPSD 803.031 Frost Treatment - Pipe Culverts, Frost Penetration Line Between Top of Pipe and  
Bedding Grade



**CONSTRUCTION SPECIFICATION FOR  
PIPE CULVERT INSTALLATION IN OPEN CUT**

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<b>421.10</b>	<b>BASIS OF PAYMENT</b>

**APPENDICES**

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**421.01 SCOPE**

This specification covers the requirements for the installation of pipe culverts, pipe culvert end sections, and concrete appurtenances in open cut.

**421.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **421.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **421.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standards Specifications, Construction**

OPSS 206	Grading
OPSS 401	Trenching, Backfilling, and Compacting
OPSS 404	Support Systems
OPSS 409	Closed-Circuit Television (CCTV) Inspection of Pipelines
OPSS 490	Site Preparation for Pipelines, Utilities, and Associated Structures
OPSS 491	Preservation, Protection, and Reconstruction of Existing Facilities
OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 510	Removal
OPSS 517	Dewatering of Pipeline, Utility, and Associated Structure Excavation
OPSS 539	Temporary Protection Systems
OPSS 904	Concrete Structures
OPSS 905	Steel Reinforcement for Concrete

### **Ontario Provincial Standard Specifications, Material**

OPSS 1004	Aggregates - Miscellaneous
OPSS 1205	Clay Seal
OPSS 1301	Cementing Materials
OPSS 1302	Water
OPSS 1350	Concrete - Materials and Production
OPSS 1440	Steel Reinforcement for Concrete
OPSS 1801	Corrugated Steel Pipe Products
OPSS 1820	Circular Concrete Pipe



OPSS 1840	Non-Pressure Polyethylene Plastic Pipe Products
OPSS 1841	Non-Pressure Polyvinyl Chloride (PVC) Pipe Products
OPSS 1843	Non-Pressure Polypropylene (PP) Plastic Pipe Products
OPSS 1860	Geotextiles

**ASTM International**

C 507-12 Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe

**421.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Backfilling** means the operation of filling the trench with bedding, cover, and backfill material or embedment and backfill material.

**Concrete Appurtenances** means concrete head walls, cut-off walls, stiffeners, aprons, collars, and any other concrete fixtures associated with the pipe culvert, excluding concrete bedding or concrete structures specified in the Contract Documents.

**Culvert End Section** means appurtenances attached to the ends of culverts for hydraulic, safety, or slope stability purposes.

**Excavation** means the excavation classified as earth and rock according to OPSS 206.

**Flexible Pipe** means pipe that can deflect 2% or more without cracking, such as polyvinyl chloride, polyethylene, or steel pipe.

**Pipe Class** means a pipe's physical material specification, such as load and pressure ratings, wall thickness, protective coatings, corrugation profiles, ring stiffness constants, and reinforcement.

**Pipe Culvert** means an installation designed to provide for the conveyance of surface water, pedestrians, or livestock using preformed or precast pipe sections, circular or non-circular in cross-section, laid end to end using suitable joint materials.

**Pipe Type** means a pipe's inner wall design, which can be smooth or corrugated.

**Polypropylene Plastic** means a material made with virgin polymers in which propylene is essentially the sole monomer.

**421.05 MATERIALS**

**421.05.01 Pipe Materials**

**421.05.01.01 General**

Pipe culvert size, type, and class shall be as specified in the Contract Documents.

Pipe culvert type shall be consistent throughout the length of the pipe culvert as specified in the Contract Documents.

Fittings shall be suitable for and compatible with the pipe type and class for which they will be used.

**421.05.01.02 Concrete Pipe**

Circular concrete pipe and joints shall be according to OPSS 1820.

Elliptical concrete pipe and joints shall be according to ASTM C 507.

**421.05.01.03 Corrugated Steel Pipe Products**

Corrugated steel pipe products shall be according to OPSS 1801.

**421.05.01.04 Polyethylene Pipe Products**

Polyethylene pipe products shall be according to OPSS 1840.

**421.05.01.05 Polyvinyl Chloride Pipe Products**

Polyvinyl chloride pipe products shall be according to OPSS 1841.

**421.05.01.06 Polypropylene Plastic Pipe Products**

Polypropylene plastic pipe products shall be according to OPSS 1843.

**421.05.02 Mortar**

Mortar for joints shall consist of one part Portland cement and two parts mortar sand, wetted with sufficient water to only make the mixture plastic. The mortar sand shall be according to OPSS 1004, the normal Portland cement shall be according to OPSS 1301, and the water shall be according to OPSS 1302.

**421.05.03 Clay Seal**

Clay seal material shall be according to OPSS 1205.

**421.05.04 Concrete**

Concrete for concrete appurtenances shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

**421.05.05 Steel Reinforcement**

Steel reinforcement shall be of the size and grade specified in the Contract Documents and shall be according to OPSS 1440.

**421.05.06 Geotextile**

Geotextile shall be according to OPSS 1860.

**421.07 CONSTRUCTION**

**421.07.01 Site Preparation**

Site preparation shall be according to OPSS 490.

**421.07.02                      Removals**

Removals shall be according to OPSS 510.

**421.07.03                      Preservation and Protection of Existing Facilities**

Preservation and protection of existing facilities shall be according to OPSS 491.

**421.07.04                      Protection Against Floatation**

Damage to the pipeline due to floatation shall be prevented during construction and until completion of the work.

**421.07.05                      Cold Weather Work**

All work shall be protected from freezing. Pipes and bedding material shall not be placed on frozen ground.

**421.07.06                      Transporting, Unloading, Storing, and Handling Pipe**

Manufacturer's recommendations for transporting, unloading, storing, and handling of pipe, shall be followed.

All pipes, fittings, and gaskets that are unsound or damaged shall be rejected.

**421.07.07                      Excavation**

Excavation for the placement of pipe culverts shall be according to OPSS 401.

**421.07.08                      Support Systems**

Support systems shall be according to OPSS 404.

**421.07.09                      Dewatering**

Dewatering shall be according to OPSS 517.

**421.07.10                      Protection Systems**

The construction of all protection systems shall be according to OPSS 539. When the stability, safety or function of an existing roadway, railway, other works, or proposed works may be impaired due to the method of operation, such protection as may be required shall be provided. Protection may include sheathing, shoring and driving piles, when necessary, to prevent damage to such works or proposed works.

**421.07.11                      Backfilling and Compacting**

Backfilling and compacting shall be according to OPSS 401.

**421.07.12 Pipe Installation**

**421.07.12.01 General**

If a universal dimple coupler or any other coupler does not follow the contour of the flexible pipe sections to be joined, polyethylene gaskets shall then be installed at all joints when such couplers are used. Polyethylene gaskets shall be installed symmetrically about the pipe joint, between the coupler and the pipe, and shall be of sufficient length to equal the circumference of the pipe plus a minimum overlap of 300 mm.

Pipe shall be laid within the alignment and grade tolerances specified in the Contract Documents. When bell and spigot pipe is laid, the bell end of the pipe shall be laid upgrade.

Pipe shall be kept clean and dry as work progresses. The trench shall be kept dry. A removable watertight bulkhead shall be installed at the open end of the last pipe laid whenever work is suspended.

Pipe shall not be laid until the preceding pipe joint has been completed and the pipe is carefully embedded and secured in place.

When the Owner raises or lowers the invert of a pipe culvert by up to 150 mm, it shall not constitute a Change in the Work and no adjustment shall be made to the payment. When the invert of a pipe culvert is raised or lowered by more than 150 mm, then this shall constitute a Change in the Work for the full extent of the change from the original grade.

The pipe culvert cut-end finish, end sections, and safety slope end treatments shall be as specified in the Contract Documents.

When installing gaskets, all pipe ends shall be thoroughly cleaned. For gaskets requiring field lubrication, a lubricant recommended by the pipe manufacturer shall be used.

When gaskets have been affixed, the pipe shall be handled in a way so that the gasket is not damaged, displaced, or contaminated with foreign matter. Any gasket displaced or contaminated shall be removed, cleaned, and lubricated, if required, and reinstalled before closure of the joint is attempted. When specified in the Contract Documents, nitrile gaskets shall be used.

The pipe shall be properly positioned by means of an appropriate mechanism. Sufficient pressure shall be applied in making the joint to ensure that the joint is in position. Sufficient restraint shall be applied to the line to ensure that joints are held in this position.

Once the pipe has been jointed, a test shall be made with a feeler gauge at intervals around the joint to ensure that the gasket has not been displaced from the spigot groove. If the gasket is found out of position, the joint shall be opened and the gasket placed in its proper position. If necessary, a new gasket shall be installed.

**421.07.12.02 Circular Concrete Pipe**

All circular concrete pipe joints shall have elastomeric gaskets.

**421.07.12.03 Non-Circular Concrete Pipe**

All non-circular concrete pipe joints shall be according to the procedures recommended by the manufacturer.

#### **421.07.12.04 Corrugated Steel Pipe Products**

Helical corrugated steel pipe without rerolled ends shall be installed so that the helix angle is constant for the total length of the installation. Each pipe section shall be installed next to the previous section so that the lockseam forms a continuous helix. For rerolled ends, the correct fit of the coupling system does not depend on the location of the helical lockseam and corrugation.

Corrugated steel pipe sections shall be joined by means of steel couplers. The couplers shall be installed to lap approximately equal portions of the pipe being connected so that the corrugations or projections of the coupler properly engage the pipe corrugations. As the coupler is being tightened, it shall be tapped with a mallet to take up the slack.

When joint seals are specified in the Contract Documents, they shall be installed immediately prior to the installation of steel couplers.

Structural plate pipe culverts may be assembled in the trench or beside the excavation. If the assembled structure has to be moved to its final position, it shall be moved so that no damage or distortion is caused to the structure.

When the structural plate pipe culvert has been placed to the alignment and grade as specified in the Contract Documents, all assembly bolts shall be retightened with a torque wrench to a minimum of:

- a) 200 N·m for 3.5 and 3.0 mm gauge of pipe.
- b) 340 N·m for heavier than 3.5 mm gauge of pipe.

#### **421.07.12.05 Polyethylene Pipe**

Polyethylene pipe shall be jointed by one of the following methods, as recommended by the pipe manufacturer:

- a) Bell and Spigot
- b) Welded Joint
- c) Thermal Fusion Joint
- d) Screw-on Coupler
- e) Split Coupler
- f) Threaded Joint

#### **421.07.12.06 Polyvinyl Chloride Pipe**

Polyvinyl chloride pipe shall be jointed, as recommended by the manufacturer, using a bell and spigot joint with an elastomeric gasket.

At the end of a day's work, the last pipe shall be blocked as may be required to prevent movement.

#### **421.07.12.07 Polypropylene Pipe**

Polypropylene pipe shall be jointed by means of a bell and spigot joint with elastomeric gasket or a coupler joint as recommended by the manufacturer to satisfy the pipe joint specification.

**421.07.13 Closed-Circuit Television (CCTV) Inspection**

When specified in the Contract Documents, pipe culverts shall be inspected using CCTV equipment. CCTV inspection of pipe culverts shall be according to OPSS 409.

**421.07.14 Cleaning and Flushing of Pipe Culverts**

When specified in the Contract Documents, pipe culverts shall be cleaned and flushed just prior to inspection and acceptance.

**421.07.15 Clay seal**

Clay seal shall be placed as specified in the Contract Documents and compacted to 95% of the Proctor maximum dry density.

**421.07.16 Concrete Appurtenances**

Concrete appurtenances shall be constructed as specified in the Contract Documents. Concrete in concrete appurtenances shall be placed according to OPSS 904. Steel reinforcement shall be placed according to OPSS 905. Steel grating shall be installed when specified in the Contract Documents.

**421.07.17 Site Restoration**

Site restoration shall be according to OPSS 492.

**421.07.18 Management of Excess Material**

Management of excess material shall be as specified in the Contract Documents.

**421.09 MEASUREMENT FOR PAYMENT**

**421.09.01 Actual Measurement**

**421.09.01.01 Pipe Culverts  
Non-Circular Pipe Culverts  
Pipe Culvert Extensions  
Non-Circular Pipe Culvert Extensions**

Measurement of pipe culverts, non-circular pipe culverts, pipe culvert extensions, and non-circular pipe culvert extensions shall be along the horizontal length of the pipe in metres, from one end of the pipe to the other end of the pipe. When the grade of the pipe culvert is 10% or greater, the above measurement shall then be of the slope length.

**421.09.01.02 Concrete Appurtenances**

Measurement for concrete appurtenances shall be by volume in cubic metres for the volume of concrete placed. Alternatively, concrete appurtenances may be a lump sum item.

**421.09.01.03 Clay Seal**

Measurement for clay seal shall be by volume in cubic metres for the volume of clay placed. Alternatively, clay seal may be a lump sum item.

**421.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**421.10 BASIS OF PAYMENT**

- 421.10.01 "size, type, class" Pipe Culverts - Item**
- "size, type, class" Non-Circular Pipe Culverts - Item**
- "size, type, class" Pipe Culvert Extensions - Item**
- "size, type, class" Non-Circular Pipe Culvert Extensions - Item**
- Clay Seal - Item**
- Concrete Appurtenances – Item**
- Culvert End Section – Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

**421.10.02 Swamp Excavation**

When the Contract requires swamp excavation to place a pipe culvert, payment for the swamp excavation shall be under the tender item covering the swamp excavation for earth embankment construction. No alterations shall be made to the tender item for the pipe culvert so affected.

**421.10.03 Closed-Circuit Television (CCTV) Inspection**

When a CCTV inspection of pipe culverts is specified in the Contract Documents, payment for the CCTV inspection shall be according to OPSS 409.

**Appendix 421-A, November 2018  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Pipe culvert size, type, and class. (421.05.01.01)
- Size and grade of steel reinforcement. (421.05.05)
- Alignment and grade tolerances, including camber, for the pipe installation. (421.07.12.01)
- Pipe culvert cut-end finish, end sections, and safety slope end treatments. (421.07.12.01)
- Alignment and grade for the placement of structural plate pipe culvert. (421.07.12.04)
- Placement of clay seal at the inlet side of culverts, as required. (421.07.15)
- Requirements to construct concrete appurtenances. (421.07.16)
- Pipe culvert size, type, class, shape, clay seal, concrete appurtenances, and end sections to complete the tender item description. (421.10.01)

The designer should determine if the following are required and, if so, add the requirement in the Contract Documents:

- Use of nitrile gaskets. (421.07.12.01)
- Use of joint seals with corrugated steel pipe products. (421.07.12.04)
- CCTV inspection and any other testing. (421.07.13)
- Cleaning and flushing prior to inspection and acceptance. (421.07.14)
- Use of steel grating. (421.07.16)
- Payment of concrete appurtenances by volume or lump sum. (421.09.01.02)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 800.010	Concrete Pipe Culvert and Sewer Extensions Using Corrugated Steel Pipe
OPSD 800.011	Concrete Rigid Frame Box and Open Culvert Extensions Using Corrugated Steel Pipe
OPSD 801.010	Cut End Finish, Circular Pipe and Pipe-Arch Corrugated Steel Pipe
OPSD 801.020	End Section Details, Corrugated Steel Pipe
OPSD 801.030	Bevel Details for Structural Plate Pipe and Pipe-Arch - Corrugated Steel Pipe



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OPSD 801.040	Culvert and Sewer Safety Slope End Treatment, Notes and Tables
OPSD 801.041	Culvert and Sewer Safety Slope End Treatment, Assembly Details
OPSD 801.042	Culvert and Sewer Safety Slope End Treatment, Connection Details
OPSD 801.043	Culvert and Sewer Safety Slope End Treatment, Installation Details
OPSD 802.010	Flexible Pipe Embedment and Backfill, Earth Excavation
OPSD 802.013	Flexible Pipe Embedment and Backfill, Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.020	Flexible Pipe Arch Embedment and Backfill, Earth Excavation
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill, Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.030	Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.031	Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.032	Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.033	Rigid Pipe Bedding, Cover, and Backfill, Rock Excavation
OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 802.050	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.051	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.052	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Rock Excavation
OPSD 802.054	Horizontal Elliptical Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 802.095	Clay Seal for Pipe Trenches
OPSD 804.030	Concrete Headwall, for Pipe Less Than 900 mm Diameter
OPSD 804.040	Concrete Headwall, for Sewer or Culvert Pipe Outlet
OPSD 804.050	Grating, for Concrete Endwall
OPSD 805.010	Height of Fill Table, Round Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe
OPSD 805.020	Height of Fill Table, Corrugated Steel Pipe Arch and Structural Plate Corrugated Steel Pipe Arch
OPSD 805.030	Height of Fill Table, Spiral Rib Round Pipe
OPSD 805.040	Height of Fill Table, Spiral Rib Pipe Arch
OPSD 806.020	Height of Fill Table, Dual Wall Corrugated Polyethylene Gravity Sewer Pipe, 210 and 320 kPa
OPSD 806.021	Height of Fill Table, Closed Profile Wall Polyethylene Pipe, RSC 160 and 250
OPSD 806.022	Height of Fill Table, Dual Wall Corrugated Polyethylene Gravity Sewer Pipe RSC 100 and RSC 160
OPSD 806.030	Height of Fill Table, Dual and Triple Wall Corrugated Polypropylene Gravity Sewer Pipe, 320 kPa
OPSD 806.040	Height of Fill Table, Polyvinyl Chloride Gravity Sewer Pipe, 210, 320, and 625 kPa
OPSD 806.060	Height of Fill Table, Polyvinyl Chloride Pressure Pipe for Different Dimension Ratios
OPSD 807.010	Height of Fill Table, Reinforced Concrete Pipe - Confined Trench, Class 50-D, 65-D, 100-D, and 140-D
OPSD 807.030	Height of Fill Table, Reinforced Concrete Pipe - Embankment, Class 50-D, 65-D, 100-D, and 140-D
OPSD 807.040	Height of Fill Table, Non-reinforced Concrete Pipe Class 3
OPSD 807.050	Height of Fill Table, Horizontal Elliptical Concrete Pipe, Class HE-A, HE-I, HE-II, HE-III, and HE-IV



**Note: The MUNI implemented in November 2017 replaces OPSS 491 COMMON, November 2010 with no technical content changes.**

**CONSTRUCTION SPECIFICATION FOR  
PRESERVATION, PROTECTION, AND  
RECONSTRUCTION OF EXISTING FACILITIES**

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**APPENDICES**

<b>491-A</b>	<b>Commentary</b>
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**491.01 SCOPE**

This specification covers the requirements of preservation, protection, replacement, and reconstruction of existing services and structures during the installation or removal of sanitary and storm pipe sewers, pipe culverts and end sections, forcemains and associated appurtenances, watermains and associated appurtenances, and other underground Utilities; maintenance holes, catch basins, ditch inlets, or valve chambers; and any other specified subsurface construction.

#### **491.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be as specified in the Contract Documents.

#### **491.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

#### **491.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

##### **Ontario Provincial Standard Specifications, Construction**

OPSS 412	Sewage Forcemain Installation in Open Cut
OPSS 441	Watermain Installation in Open Cut

#### **491.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Associated Appurtenances** means as defined in OPSS 412 and OPSS 441.

## **491.07 CONSTRUCTION**

### **491.07.01 General**

The requirements and regulations of road authorities, Utility companies, and railway companies shall be adhered to at all times.

### **491.07.02 Notification**

All road authorities, Utility companies, and railway companies shall be notified in writing at least 48 hours before approaching their facilities or entering their rights-of-way.

All owners of underground services shall be requested to locate, stake, and clearly mark in the field all underground services which are located on or near the line of the proposed work. Certificates shall be obtained from all owners of underground services having facilities in the area of the proposed work certifying that their facilities have been marked to confirm the Utility location.

Necessary arrangements shall be made with railway companies for the support and protection of their tracks.

### **491.07.03 Existing Services and Structures**

All water or gas mains, sewers or drains, conduits, cables, service pipes, sidewalks, curbs, and all other structures or property in the vicinity of the work, whether above or underground shall be sustained in place and protected from damage. All water and gas service and flow in all sewers, drains, house or inlet connections, and all watercourses encountered during the progress of the work shall be maintained.

Excavation shall be performed with care to expose buried pipes, cables, conduits, and structures whenever trenching operations approach the indicated location of buried services.

If any Utility is broken or damaged, the Utility company shall be immediately notified.

Access to fire hydrants and water and gas valves shall be maintained at all times to the satisfaction of the local authority.

### **491.07.04 Reconstruction of Existing Facilities**

Where an existing Utility is within the limits of or crosses an excavation and cannot be sustained in place, the existing facility shall be removed, realigned, relocated, or replaced as directed in writing by the Contract Administrator. All materials comprising the Utility shall be handled with care, cleaned, salvaged, and inspected before reconstruction commences.

### **491.07.05 Contamination**

The contents of any sewer, drain, or inlet connection shall not be allowed to flow into an excavation.

All offensive matter shall be removed from the proximity of the work.

### **491.07.06 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

## **491.10 BASIS OF PAYMENT**

Payment at the Contract price for the appropriate tender items for the installation of sanitary and storm pipe sewers, pipe culverts and end sections, forcemains and associated appurtenances, watermains and

associated appurtenances, and other underground Utilities; maintenance holes, catch basins, ditch inlets or valve chambers; and any other specified subsurface construction, shall be full compensation for all labour, Equipment, and Material to do the work of the preservation, protection, or reconstruction of existing facilities.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

**Appendix 491-A, November 2017  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**Note: The MUNI implemented in November 2017 replaces OPSS 506 COMMON, November 2013 with no technical content changes.**

## **CONSTRUCTION SPECIFICATION FOR DUST SUPPRESSANTS**

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### **APPENDICES**

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### **506.01 SCOPE**

This specification covers the requirements for dust suppressants and their application.

#### **506.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **506.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **506.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Material**

OPSS 2501 Calcium Chloride  
OPSS 2503 Magnesium Chloride Solid and Magnesium Chloride Solution

### **Others**

Environmental Protection Act, Ontario Regulation 347, General - Waste Management - R.R.O. 1990

Ministry of the Environment and Climate Change (MOECC) - Certificate or Provisional Certificate of Approval for a Dust Suppression Waste Management System

## **506.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **506.04.01 Submission Requirements**

Dust suppressants other than water, calcium chloride solid, calcium chloride solution, magnesium chloride solid, magnesium chloride solution, and calcium-magnesium chloride blend, or as specified in the Contract Documents shall be approved by the Contract Administrator. The following shall be submitted with a request to approve the dust suppressant within one week of execution of the Contract:

- a) The name of the material.
- b) The name of the manufacturer or supplier.



- c) The manufacturer's guidelines and recommendations for application rates that meet or exceed the performance of calcium chloride or magnesium chloride.

Dust suppressants containing waste material shall be as approved by the Contract Administrator. A copy of a Certificate or Provisional Certificate of Approval for a Dust Suppression Waste Management System shall also be included with the request to approve the dust suppressant. The certificate shall be valid for:

- a) The entire period of the Contract.
- b) The entire area within the limits of the Contract and the entire haul route.
- c) The equipment to be utilized.
- d) The point of supply.
- e) The relevant Ministry of Environment waste classification.
- f) Mixtures with any other material, with the exception of water, if mixtures are to be applied.

Prior to the application of dust suppressants containing waste material, the Contract Administrator shall be provided with a completed blue coloured copy (#5) of the Ontario Regulation 347, General - Waste Management manifest for each shipment of waste.

**506.05 MATERIALS**

**506.05.01 Water**

Water shall be free of contaminants that could adversely affect fill material or the environment.

Water shall be free of foreign material that would alter the dust suppressant solution or cause blockage in the spray equipment.

**506.05.02 Calcium Chloride Solid, Calcium Chloride Solution, and Calcium-Magnesium Chloride Blend**

Calcium chloride solid, calcium chloride solution, and calcium-magnesium chloride blend shall be according to OPSS 2501.

Calcium chloride solution may be substituted for calcium chloride solid.

**506.05.03 Magnesium Chloride Solid and Magnesium Chloride Solution**

Magnesium chloride solid and magnesium chloride solution shall be according to OPSS 2503.

Magnesium chloride solution may be substituted for magnesium chloride solid.

**506.06 EQUIPMENT**

**506.06.01 General**

Application equipment shall be capable of distributing the dust suppressant in a uniform manner at an application rate specified in the Contract Documents.

**506.06.02****Pressure Distributors**

Pressure distributors shall be propelled by a power unit capable of accurately maintaining any speed required for spraying and shall be provided with the following minimum equipment:

- a) A pump capable of developing in the spray manifold a constant uniform pressure to sustain the required application.
- b) A pressure gauge indicating the pressure within the spray bar graduated in increments of 15 kPa or less and visible to the operator.
- c) A rear mounted spray bar having a cab-activated positive and instant shut off that can be set at variable heights parallel to the surface and to any spraying width from 1 to 3 m to spray any portion of the roadway surface, including the shoulders. The spray bar nozzles shall be:
  - i. All of the same manufacture and size.
  - ii. Clean and in good working condition.
  - iii. Designed and set to ensure uniform fan shaped spray without atomization.

Nozzles shall be set in the spray bar at an angle permitting each spray fan to overlap adjacent spray fans in such a manner that complete coverage of the spray area is maintained should there be a malfunction of one nozzle.

- d) A strainer installed in the feed system to prevent clogging of the spray bar nozzles.
- e) A device or method that allows the operator to determine the volume remaining in the tank to an accuracy of 200 litres.
- f) Splash guards or other approved devices for shoulder spraying that shall permit spraying immediately adjacent to the pavement without over-spraying the pavement surface.
- g) A system (e.g., meter, GPS device, ground speed sensors, or calibration charts) that allows the operator to determine the rate of application with accuracy while spreading the dust suppressant.

**506.07****CONSTRUCTION****506.07.01****General**

Dust suppressants shall be applied according to the obligations imposed by any Certificate or Provisional Certificate of Approval for a Dust Suppression Waste Management System.

Water shall be the only dust suppressant applied within two weeks before the placement of any asphaltic concrete materials or the application of surface treatments.

Approved dust suppressants other than water, calcium chloride solid, calcium chloride solution, magnesium chloride solid, magnesium chloride solution, and calcium-magnesium chloride blend shall be applied according to the manufacturer's guidelines and application rates.

Steps shall be taken as necessary to control dust resulting from operations or by public traffic such that it does not:

- a) affect traffic,
- b) enter surface waters, or

c) escape beyond the right-of-way to cause a nuisance to residents, businesses, or utilities.

Dust suppressants shall be applied in a manner that avoids ponding, runoff, drifting, and tracking of the material beyond the area of application.

Dust suppressant application shall not proceed during periods of rain when the surface is in a saturated condition or on areas of ponded water.

Dust suppressants other than water shall not be applied when weather forecasts indicate a high probability of rainfall in order to minimize loss of the material from the intended area of application. Areas receiving rainfall within 6 hours after application may require reapplication of the material.

Dust suppressants containing waste material shall not be stored on the Owner's property.

#### **506.07.02 Dust Suppressant Solution**

Dust suppressant solutions shall be applied by a pressure distributor. The application rate per kilometre shall be confirmed by running 250 m test sections in the presence of the Contract Administrator. Solution application rates shall be measured in t/km or in L/m<sup>2</sup>.

For the maintenance of existing roadways, dust suppressant solutions shall be applied to a prepared surface. Work shall commence within 3 Working Days of receiving notice from the Contract Administrator and shall proceed continuously until completed.

#### **506.07.03 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

### **506.09 MEASUREMENT FOR PAYMENT**

#### **506.09.01 Water for Dust Suppression**

Measurement of water for dust suppression shall be by volume in cubic metres by one of the following methods for the quantity used in the work:

- a) The mass of the water shall be determined by weighing according to the Contract Documents and shall be the difference between the mass of the empty water tank and carrying vehicle and the mass of the full tank and carrying vehicle. The mass of the water shall be converted to cubic metres using a factor of 1,000 kg to 1 m<sup>3</sup>.
- b) The water tank shall be measured and its volume computed in cubic metres.
- c) The water shall be measured through a water meter acceptable to the Contract Administrator.

#### **506.09.02 Calcium Chloride Solid and Magnesium Chloride Solid**

Measurement for calcium chloride solid and magnesium chloride solid shall be by mass in kilograms.

#### **506.09.03 Calcium Chloride Solution**

Measurement of calcium chloride solution shall be by mass in tonnes of solution, by volume in litres of solution, or by mass of equivalent solid as specified in the Contract Documents. The mass and volumetric measurement of calcium chloride solution shall be according to OPSS 2501.

**506.09.04                      Magnesium Chloride Solution**

Measurement of magnesium chloride solution shall be by mass in tonnes of solution, by volume in litres of solution, or by mass of equivalent solid as specified in the Contract Documents. The mass and volumetric measurement of magnesium chloride solution shall be according to OPSS 2503.

**506.09.05                      Calcium-Magnesium Chloride Blend**

Measurement of calcium-magnesium chloride blend shall be by mass in tonnes of solution or by volume in litres of solution as specified in the Contract Documents. The mass and volumetric measurement of calcium-magnesium chloride blend shall be according to OPSS 2501.

**506.10                              BASIS OF PAYMENT**

- 506.10.01                      Water for Dust Suppression - Item**
- Calcium Chloride Solid - Item**
- Calcium Chloride Solution - Item**
- Magnesium Chloride Solid - Item**
- Magnesium Chloride Solution - Item**
- Calcium-Magnesium Chloride Blend - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract does not contain a separate tender item for any of the above items, the Contract price for the applicable tender item for which dust suppression is required shall be full compensation for all labour, Equipment, and Material to do the work.

**Appendix 506-A, November 2017  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- The dust suppressant material by type. (506.04.01)
- Method of measurement for dust suppressant solution. (506.09.03, 506.09.04, 506.09.05)
- A tender item for payment of a dust suppressant. (506.10.01)

When a dust suppressant other than water, calcium chloride solid, calcium chloride solution, magnesium chloride solid, magnesium chloride solution, or calcium-magnesium chloride blend is to be applied, the concentration and the volumetric conversion should be identified.

The proper use and application of all dust suppressants is the responsibility of the applicator and is subject to applicable Ministry of Environment requirements under legislation such as the *Environmental Protection Act* (EPA) and the *Ontario Water Resources Act*.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**CONSTRUCTION SPECIFICATION FOR  
CHAIN-LINK FENCE**

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**772.01 SCOPE**

This specification covers the requirements for the installation of chain-link fence.

**772.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **772.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **772.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 904 Concrete Structures

### **Ontario Provincial Standard Specifications, Material**

OPSS 1541 Chain-Link Fence Components

### **CSA Standards**

W59-13 Welded Steel Construction (Metal Arc Welding)

### **ASTM International**

A 123/A 123M-17	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A 780/A 780M-09 (2015)	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
B 209-14	Aluminum and Aluminum-Alloy Sheet and Plate

For the purpose of this specification, the following definitions shall apply:

**Barbed Wire** means the twisted longitudinal wires, termed line wires, to which the barbs are attached.

**Barbed Wire Arm** means the metal arm to support the barbed wire.

**Bottom Wire** means the wire installed at the bottom of fence and fastened to the bottom of the fence fabric and extending throughout each section of fence between terminal posts.

**Brace Band** means a symmetrically formed strip of metal shaped to fit around a post and used with a carriage bolt and nut to attach the rail end or brace rail end to the post. Also, used for attaching barbed wire, tension wire, and other items to a terminal post.

**Brace Rail** means a tubular or fabricated steel section used for bracing terminal posts.

**Corner Post** means a terminal post when the direction of the line of fence changes in two or more directions.

**Diagonal Brace Wire** means the wire used for bracing terminal posts.

**End Post** means the fence post positioned at the ends of a section of fence.

**Fence Post** means an upright tubular or fabricated steel member for supporting fencing material.

**Fitting** means the mechanical connection of various designs, shapes, and metals to join fence components into an integral structure.

**Gatepost** means a terminal post on each side of a gate forming a gateway.

**Hog Ring** means a preformed open wire clip designed to close up into a ring to secure chain-link fabric to horizontal top and bottom wires.

**Knuckled** means the type of selvage obtained by interlocking adjacent wire ends in pairs and then bending the wire ends back into a closed loop.

**Line Post** means the fence post spaced at regular intervals between terminal posts throughout each section of fence.

**Line Post Cap** means a cap or top with a loop or hole used to position the top rail or top wire on top of the line posts. It also prevents water from entering the tubular post.

**Marcelled Tension Wire** means a type of wire manufactured with either a uniform helix or a series of waves put into the wire to facilitate tensioning the wire when installed to support the top or bottom of the chain-link fence fabric.

**Post Sleeve** means a specified length of tube or pipe set into a concrete retaining wall into which fence posts are placed.

**Rail End** means a cup-shaped fitting used with a brace band to connect the top rail or brace to a post.

**Selvage** means the edge finish on woven chain-link fabric joining pairs of pickets. The selvage may be knuckled or twisted.



**Straining Post (or Pull Post)** means a terminal post in a line of fence to brace a long stretch or to effect a change in elevation along a fence line.

**Tension Band** means an offset strip of metal shaped to fit around the terminal post and used with a carriage bolt and nut to attach the tension bar to the post.

**Tension Bar** means the bar used with tension bands to secure the fence fabric to a terminal post.

**Terminal Post** means end, gate, corner, and straining post.

**Terminal Post Cap** means a cap atop a post (end, gate, corner or straining post) that prevents water from entering the tubular post.

**Top Rail** means a tubular or fabricated steel section continuously joined by means of sleeves or couplings throughout all sections of fence extending between terminal posts.

**Top Rail Sleeve** means a fitting used to join two pieces of top rail when swedged top rail is not used.

**Top Wire** means the wire installed at the top of fence and extending continuously throughout all sections of fence between terminal posts.

**Twisted** means the type of selvage obtained by interlocking adjacent wire ends in pairs and then twisting the wire at least two turns with the wire ends above the twist.

**Wire Ties** means the wire used to tie chain-link fence fabric to line posts, bottom wires, and top rails or top wires.

## **772.05 MATERIALS**

### **772.05.01 Chain-Link Fence**

Chain-link fence components shall be according to OPSS 1541.

### **772.05.02 Concrete**

Concrete shall have a nominal minimum 28-Day compressive strength of 20 MPa.

## **772.07 CONSTRUCTION**

### **772.07.01 Site Preparation**

Prior to the commencement of fencing operations, all debris shall be removed and ground undulations shall be corrected along the fenceline to obtain a smooth and uniform gradient.

All trees, stumps, and brush along the fenceline shall be cut off at ground level and all logs and overhanging branches that interfere with the installation of the fence shall be removed.

**772.07.02 Chain-Link Fence**

**772.07.02.01 General**

Chain-link fence shall be installed at locations specified in the Contract Documents.

Survey reference points or permanent property boundary markers shall not be disturbed or moved without the authorization of the Contract Administrator. When it is necessary to set posts adjacent to such points, the posts shall be placed on the roadway side of the property line as close as feasible to the monuments or markers.

**772.07.02.02 Post Installation**

**772.07.02.02.01 General**

All posts shall be installed plumb and to the depth specified in the Contract Documents.

Posts shall be cut to the required height above the ground to present a smooth and uniform profile. Line post spacing shall be in equal horizontal distances with a maximum of 3,000 mm between line posts.

All posts shall be fitted with waterproof metal caps designed to fit and fasten securely over the posts. All line post caps shall carry either the top rail or top wire as specified in the Contract Documents.

Corner posts shall be installed at horizontal deflections in the fence line of 10 degrees or more.

Straining posts shall be installed at equal intervals not exceeding 150 m. Additional straining posts shall be installed when changes in vertical alignment of the fence exceed 30 degrees.

**772.07.02.02.02 Posts On Concrete Barrier**

All posts installed on concrete barrier shall be according to the Contract Documents.

Each post shall be fabricated with a welded steel base plate grade 300W, hot dip galvanized according to ASTM A 123, and according to the Contract Documents. All welds shall be to a low hydrogen classification according to CSA W59. Manual electrodes shall be E7015, E7016, or E7018. All welds shall be continuous.

**772.07.02.02.03 Footings**

All posts shall be installed according to the Contract Documents.

Concrete placing, curing, and protection from the elements shall be according to OPSS 904.

**772.07.02.03 Bracing**

A brace rail or brace wire shall be placed diagonally across the panel at all ends and gateposts. Corner and straining posts shall be supported with diagonal braces placed on both sides of the post. The higher end of the diagonal brace shall be connected at the terminal post.

End fittings shall be secured by a 6 mm bolt placed through the fitting and braced at both ends of the brace.

#### **772.07.02.04 Top Rails, Top Wires, and Bottom Wires**

Top rails or top wires shall be installed as specified in the Contract Documents.

Top rails or top wires shall be fastened securely to line post tops using waterproof caps.

In sag locations, the post and cap shall be drilled and fastened with a self-tapping screw to ensure a secure fit.

Top rails shall be fastened to terminal posts with centre bands.

Top and bottom wires shall be stretched tight and securely fastened to terminal posts with turnbuckles and centre bands.

One turnbuckle shall be used between terminal posts.

#### **772.07.02.05 Fence Fabric**

Fence fabric shall not be installed until the concrete footings have cured for a minimum of 5 Days.

The fabric shall be stretched tight and securely fastened to terminal posts with steel tension bars and steel or aluminum tension bands. The longitudinal axis of the diamond pattern shall be perpendicular to the slope of the top rail or top wire.

The fabric shall be placed on the side of the post nearest the roadway with the barbed edge at the top, except on curves of 50 m or smaller radius, the fabric shall be placed on the side of the post away from the centre of the curve.

The fabric shall be securely fastened to the line posts, bottom wire, and top rail or top wire with wire ties. The fabric shall not be fastened to any diagonal braces.

Manually fastened round wire ties shall engage one strand of the chain-link fence fabric with one end of the tie by wrapping it with two 360 degree turns and then wrapping the body of the tie around the post or top rail a minimum of 180 degrees. The remaining end of the tie shall be secured to the second strand of the chain-link fence fabric by wrapping it with two 360 degree turns. The fabric and the main body of the tie shall be drawn tightly to the rail or post.

Power fastened wire ties shall engage two strands of the chain-link fence fabric at a diamond joint closest to the post or top rail. The manufacturer's installation instructions shall be followed to complete the operation. The ends shall be twisted three full twists or one and one half machine turns. The end of the tie shall be positioned on the post or rail so that it is parallel to the chain-link fence fabric.

The ends of wire ties shall not protrude beyond the vertical plane on either side of the chain-link fence fabric. Protruding ends of wire ties shall be removed.

The hog rings on top and bottom wires shall be installed according to the Contract Documents.

#### **772.07.02.06 Barbed Wire**

Barbed wire shall be installed when specified in the Contract Documents. The barbed wire shall be pulled taut to remove all slack and shall be firmly installed in the slots of the barbed wire arms. The ends of the barbed wire shall be securely connected at the terminal posts with brace bands. Barbed wire arms shall be installed with the arm pointing away from the roadway.

### **772.07.03 Gates**

Gates shall be installed at locations and of the type and size as specified in the Contract Documents.

#### **772.07.03.01 Gate Installation**

Gates shall be constructed with the fabric on the side furthest from the roadway with the barbed edge at the top.

All gates shall have a chain hook to hold gates open and double gates shall have a steel gate centre rest with a drop bolt for the closed position.

The surface grade within the required gate sweep area shall be low enough to permit free movement of the gate.

#### **772.07.04 Marking**

Identification plates, provided by the material supplier, shall be securely attached to the completed fence installation at the following intervals:

- a) At the start and end of each fence installation.
- b) At a maximum interval of 300 m.

The fence identification plate shall be located within 300 mm of a terminal post with the top of the plate located approximately 300 mm from the top of the fence fabric. The maximum dimensions of the plate shall be 200 by 200 mm. The plate shall be made from 0.81 mm thick anodized aluminum sheet according to ASTM B 209 series 1100 or 5005-H34.

Each fence identification plate shall be engraved with the following information:

- a) Contract number.
- b) Name or trademark of fence Subcontractor.
- c) Name or trademark of fence supplier (i.e., supplier(s) of fence fabric and posts)
- d) Date of completed installation (i.e., yyyy-mm).

The height of the letters and numerals shall be within the range of 6 to 32 mm.

#### **772.07.05 Zinc Coating Repairs**

Cut ends, field drilled holes, and damaged areas of hot dip galvanized coatings on galvanized components shall be repaired according to ASTM A 780.

#### **772.07.06 Site Restoration**

After fence installation, the site shall be cleaned and trimmed and the ground restored to a neat and original condition existent prior to the fencing operations.

#### **772.07.07 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**772.08 QUALITY ASSURANCE**

**772.08.01 Construction**

The Contract Administrator may perform a spot visual inspection to determine conformance with the workmanship, design, and dimensional requirements of this specification.

Failure to conform to the specification may result in a partial or complete inspection of the installation and removal and replacement of all defective workmanship or materials.

**772.08.02 Material Certification**

Certificates of compliance for each fence component used in the installation shall be provided to the Contract Administrator. The certificate of compliance shall indicate that the material was manufactured, sampled, tested, and inspected in accordance with the reference specification and has been found to meet the requirements.

Each certificate of compliance shall include the following information typed on company letterhead:

- a) Manufacturer's name or trademark.
- b) General description of the component.
- c) Reference specification for material (e.g., CGSB 138.1 Fence Fabric for Chain-Link Fence).
- d) Signed and dated by the manufacturer's authorized representative.

All certificates of compliance shall be assembled and submitted to the Contract Administrator prior to completion of the Work.

**772.08.03 Material Sampling**

The Contract Administrator may obtain and test samples to ensure compliance with the specifications. Products represented by the test samples that are not in compliance shall be removed from the Work Area and replaced.

**772.09 MEASUREMENT FOR PAYMENT**

**772.09.01 Actual Measurement**

**772.09.01.01 Chain-Link Fence**

Measurement of chain-link fence shall be by length in metres along the contour of the ground for the actual length of fence installed and shall include gate openings.

**772.09.01.02 Gates**

For measurement purposes, a count shall be made of the number of gates installed, regardless of the size and type. Double gates shall be counted as one gate.

**772.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**772.10 BASIS OF PAYMENT**

**772.10.01 Chain-Link Fence - Item  
Gates - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

**772.10.02 Removals and Replacements**

Costs associated with any required removals and replacements of defective workmanship or materials shall be the Contractor's responsibility at no cost to the Owner.

**Appendix 772-A, April 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Chain-link fence locations. (772.07.02.01)
- Locations of top rail or top wire to be used. (772.07.02.02.01)
- Barbed wire locations. (772.07.02.06)
- Gate locations, type, and size. (772.07.03)

The designer should consider the placement of the fence fabric in relation to the post when the fence is located between two roadways and when snow loading from ploughing operations could separate the fence fabric from the post, (e.g., freeway and service road).

When chain-link fence is located adjacent to a highway, a top rail represents a potential spearing hazard. The default installation method will be to install chain-link fence with top wire. For those installations where the chain-link fence will be installed in a non-roadside installation (e.g., park, recreation facility, storm water management facility, etc.), when, as a minimum, the chain-link fence is located beyond the clear zone, the designer may specify a top rail when desired. (772.07.02.02.01 and 772.07.02.04)

See MTO Roadside Design Manual for additional information.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 972.101	Fence, Chain-Link, Component - Barbed Wire
OPSD 972.102	Fence, Chain-Link, Component - Gate
OPSD 972.130	Fence, Chain-Link, Installation - Roadway
OPSD 972.131	Fence, Chain-Link, Installation - Concrete Barrier
OPSD 972.132	Fence, Chain-Link, Details and Table



## **CONSTRUCTION SPECIFICATION FOR TOPSOIL**

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### **APPENDICES**

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#### **802.01 SCOPE**

This specification covers the requirements for stockpiling, supplying, and placing topsoil.

##### **802.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.



## **802.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **802.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206	Grading
OPSS 501	Compaction
OPSS 804	Seed and Cover
OPSS 805	Temporary Erosion and Sediment Control Measures

### **Ontario Provincial Standard Specifications, Materials**

OPSS 1860	Geotextiles
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### **Ontario Ministry of Transportation Publications**

Laboratory Testing Manual:

LS-706	Moisture - Density Relationship of Soils Using 2.5 kg Rammer and 305 mm Drop
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### **ASTM International**

D2974-14	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D4972-13	pH of Soils

**802.05 MATERIALS**

**802.05.01 Topsoil**

Topsoil shall be a fertile loam material that is free of roots, vegetation, or other debris of a size and quantity that prevents proper placement of the topsoil. The topsoil shall not contain material greater than 25 mm in size, such as stones and clods.

Imported topsoil shall not have contaminants that adversely affect plant growth.

Topsoil shall not be from swamps or muskeg areas, unless specified in the Contract Documents.

Topsoil shall meet the following physical property requirements or as specified the Contract Documents:

- a) Have an organic content between 7 and 11% by weight, according to ASTM D2974; and
- b) Have a pH from 6.0 to 8.0 according to ASTM D4972.

**802.07 CONSTRUCTION**

**802.07.01 Stockpiling Topsoil**

Topsoil shall be removed, stockpiled, and managed as specified in the Contract Documents.

Stockpiles shall not exceed 3 m in height.

Stockpiles shall be constructed neatly with uniform surfaces. When required, the top surface shall be dished.

Stockpiles shall be protected from erosion by covering with tarps or geotextile according to OPSS 1860 to prevent soil erosion and contamination by weeds during storage. Alternatively, topsoil stockpiles can be stabilized by temporarily establishing groundcover vegetation composed of non-invasive species by application of seed according to OPSS 804. Mounds shall be completely surrounded by sediment barriers or compost filter socks according to OPSS 805.

**802.07.02 Preparation for Topsoil**

Areas where topsoil is to be placed shall be graded according to OPSS 206. The surface shall be scarified to a depth of 50 to 100 mm. It shall be free of all vegetation, debris, and stones which would not be covered by the depth of topsoil specified in the Placement of Topsoil subsection.

These areas shall be maintained in the condition described above until the topsoil is placed.

**802.07.03 Placement of Topsoil**

Topsoil shall be tested 15 Business Days before placement for the physical quality requirements listed in the Topsoil subsection.

Topsoil shall be placed to a uniform depth of 150 mm on areas specified in the Contract Documents and up to the subgrade elevation on the roadway front slope.

Soil from swamps or muskeg areas, when used in place of topsoil, shall be placed according to the Contract Documents to a uniform depth of 150 mm, with no woody material protruding more than 50 mm above the surface.

**802.07.04                      Compaction of Topsoil**

Compaction of the topsoil, if required, shall not exceed 85% of its maximum dry density, according to LS-706.

**802.07.05                      Quality Control**

**802.07.05.01                  Compaction Testing of Topsoil**

Compaction testing shall be based on material placed and compacted in the work on a Lot-by-Lot basis according to Table 1.

Compaction acceptance shall be according to the Acceptance of Compaction subsection.

**802.07.06                      Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**802.08                              QUALITY ASSURANCE**

**802.08.01                      General**

A laboratory designated by the Owner may carry out QA testing for purposes of ensuring that the topsoil used in the Work is according to the requirements of this specification. Test results shall be forwarded to the Contractor, as they become available.

The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise specified in this specification.

**802.08.02                      Properties of Topsoil**

A minimum of one random duplicate sample of surface soil shall be taken from each Lot, according to the Lot schedule shown in Table 1.

One portion of the duplicate sample representing each Lot shall be tested for the requirements listed in the Topsoil clause.

The Lot of topsoil shall be deemed to be acceptable if all of the test results for the sample representing that Lot meet all applicable requirements of this specification.

If QA test results do not meet all of the requirements of this specification, then the entire Lot shall be rejected and replaced; the Contractor may submit a proposal for remediation or for use of the topsoil, subject to the approval of the Owner.

**802.08.03 Acceptance of Compaction**

Acceptance testing for compaction of topsoil shall be conducted in Lots according to Table 1, according to OPSS 501, for earth, with the exception of the following:

- a) Control strips shall not be used to establish target densities; and
- b) A Lot shall be considered acceptable for compaction, if:
  - i. The mean percent compaction of the individual test results for the 4 sublots is between 80 and 85%; and
  - ii. No more than two individual test results are less than 78% or greater than 87%; of the soil's maximum dry density, according to LS-706, and tested according to OPSS 501.

**802.08.04 Referee Testing**

Referee testing may be invoked for one or more physical property attributes by submitting a written request to the Contract Administrator, within 5 Business Days following notification that a sample representing a Lot of topsoil does not meet the requirements of this specification.

Referee testing shall be carried out, as specified elsewhere in the Contract Documents. The retained duplicate QA samples shall be used for referee testing.

All referee test results for each Lot shall replace the respective QA test results for acceptance of the applicable Lot and those results shall be binding on both the Owner and the Contractor.

If a Lot is not accepted, based on the referee test results, then the Contractor shall be responsible for the cost of the referee testing of that Lot, at the rates specified in the Contract Documents.

In all other cases, the Owner shall bear the cost of the referee testing.

**802.09 MEASUREMENT FOR PAYMENT**

**802.09.01 Actual Measurement**

**802.09.01.01 Topsoil from Stockpiles**

Measurement shall be by volume in cubic metres of topsoil placed from a stockpile.

**802.09.01.02 Topsoil, Imported**

Measurement shall be by volume in cubic metres of topsoil imported and placed.

**802.10 BASIS OF PAYMENT**

**802.10.01 Topsoil**

Rejected material shall not be used and shall be removed and replaced, at no additional cost to the Owner.

**802.10.02 Compaction**

Any Lot that does not meet the requirements, shall be scarified and compacted to meet the requirements listed in Acceptance of Compaction subsection b), at no additional cost to the Owner.

**802.10.03                      Preparation for Topsoil - Item**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

Payment for this item shall be on surfaces graded under a previous Contract that require preparation for topsoil.

There is no payment for this item on surfaces constructed on this Contract.

**802.10.04                      Topsoil from Stockpiles - Item**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

**802.10.05                      Topsoil, Imported - Item**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

**TABLE 1**  
**Lot Schedule for Sampling and Testing of Topsoil**

Quantity of Topsoil Used (m <sup>3</sup> )	Quantity of Topsoil Used (m <sup>2</sup> )	Minimum Lot Schedule
< 100	< 670	Sampling and Testing Shall be Carried out at the Discretion of the Contract Administrator
100 - 500	670 - 3,330	One Lot
> 501 - 1,000	> 3,331 - 6,670	Two Lots
> 1,001	> 6,671	One Lot per 1000 m <sup>3</sup>

**Appendix 802-A, November 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Topsoil from swamps or muskeg areas. (802.05.01)
- Topsoil requirements in natural areas where pH and/or organic content may fall outside required ranges. (802.05.01)
- Topsoil removal and stockpiling areas. (802.07.01)
- Topsoil placement areas. (802.07.03)
- Topsoil placement areas from swamps or muskeg areas. (802.07.03)
- Rates of the referee testing. (802.08.04)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**CONSTRUCTION SPECIFICATION FOR  
SEED AND COVER**

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**APPENDICES**

<b>804-A</b>	<b>Commentary</b>
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**804.01 SCOPE**

This specification covers the requirements for seeding with either rolled erosion control products or hydraulically applied erosion control products.

**804.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.



## **804.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

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Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **804.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Ministry of Transportation Publication**

Seeding and Cover Quality Assurance Visual Inspection Field Guide

### **Canadian and Provincial Statutes**

Canada Fertilizers Act (R.S., 1985, c. F-10)

Canada Seeds Act (R.S., 1985, c. S-8)

## **804.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Cover** means any approved or specified material such as rolled erosion control products, (i.e., blankets) or hydraulically applied erosion control products (i.e., hydraulic mulch, bonded fibre matrix, fibre reinforced matrix) applied at the time of seeding to provide temporary erosion control and protection of the germinating seed.

**Cultivate** means to prepare and work the soil with agricultural implements to provide a specified depth of loose, friable soil as a suitable medium to germinate seed.

**Fibre Reinforced Matrix (FRM)** means any approved or specified hydraulically applied erosion control product applied to provide cover, in which mechanical and chemical bonding techniques including water resistant tackifiers and flocculants are used to interlock fibres together to form a matrix that bonds to the soil surface.

**Seeded Earth Area** means the prepared earth area that has received the applied seed and fertilizer.

**Uniform, Cohesive Mat** means an application of cover that is unvarying in consistency and when all of the cover material particles are consolidated and adhere together to produce a solid layer that protects the seeded earth area from heat and adverse environmental conditions, yet allows moisture to percolate into the underlying soil.

**Waterbody** means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

## **804.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **804.04.01 Submission Requirements**

A legible, valid Certificate of Seed Analysis from a seed testing laboratory approved by the Canadian Food Inspection Agency for all single seed species and all seed mixtures to be used on the Contract shall be provided to the Contract Administrator 24 hours prior to any seeding operations.

## **804.05 MATERIALS**

### **804.05.01 Seed**

#### **804.05.01.01 Grade Standards**

All seed supplied, either as single seed species or as a seed mix shall comply with the provisions of the Canada Seeds Act and Regulations and the grade standards for that particular seed type.

Birdsfoot Trefoil mix shall contain only certified Blue Tag Leo Birdsfoot Trefoil.

#### **804.05.01.02 Certificate of Seed Analysis**

The Certificate of Seed Analysis shall stipulate the seed supplier's lot designation numbers.

Test results from the Certificate of Seed Analysis shall specify germination and purity for each seed species of the mix, as well as the seed mix composition expressed as a percentage of each seed species by mass for each seed mix specified in the Contract Documents. Test results shall comply with the values shown in Table 1 for the various seed mixes.

#### **804.05.01.03 Seed Packaging, Labelling, and Storage**

All seed and seed mixes shall be in the original factory sealed package with the original legible label securely attached.

Labelling shall be in accordance with the requirements of the Canada Seeds Act and Regulations. Each package shall be labelled to show:

- a) The name and address of the seed supplier.

- b) The name of the seed mix and the various individual seed species that comprise the seed mix and the percentage by mass of each.
- c) The grade of the seed or seed mix.
- d) The supplier's lot designation number corresponding to the Certificate of Seed Analysis.
- e) Mass in kilograms of the seed mix.
- f) The inoculant type, strain, and expiry date.

All seed and inoculant shall be stored in cool, dry locations until use. Inoculant is only required for seed mixes containing Crown Vetch or Birdsfoot Trefoil.

**804.05.01.04                      Permanent Seed Mixes**

Permanent seed mixes shall be as specified in the Contract Documents and as shown in Table 1.

**804.05.02                              Annual Nurse Crop Seed**

Nurse crop seed shall be either Fall Rye Grain or Winter Wheat Grain, unless otherwise approved by the Contract Administrator.

**804.05.03                              Fertilizer**

Fertilizer shall comply with the provisions of the Canada Fertilizers Act and Regulations. Fertilizer shall be supplied in original factory sealed bags bearing the manufacturer's original label indicating mass and analysis. All fertilizer shall be in granular form being dry, free flowing, free from lumps, and with an analysis shown in Table 2.

**804.05.04                              Cover**

**804.05.04.01                      Straw Mulch**

Straw mulch shall be oat or wheat straw. Straw shall be supplied in bales, dry, and free of weeds and other foreign materials.

**804.05.04.02                      Straw Mulch Tackifiers**

Organic straw mulch tackifiers may include wood and fibre paper mulch or guar and starch based tackifiers. Asphalt based tackifiers are not acceptable.

**804.05.04.03                      Hydraulic Mulch**

Hydraulic mulch shall be capable of dispersing rapidly in water to form a homogeneous slurry and remain in such a state when agitated or mixed with other specified materials. When applied, hydraulic mulch shall be capable of forming a uniform, cohesive mat. Hydraulic mulch shall not inhibit growth or germination of the seed mix. Hydraulic mulch shall be dry, free of weeds and other foreign materials, and shall be supplied in factory sealed packages bearing the manufacturer's label indicating the product name and mass.

#### **804.05.04.04 Bonded Fibre Matrix (BFM) and Fibre Reinforced Matrix (FRM)**

BFM and FRM shall be a hydraulically applied, 100% biodegradable product, which after application is capable of adhering to the soil. In a dry state, BFM shall be comprised of not less than 70% by weight of long stranded wood fibres held together by organic or mineral bonding agents or both. The hydrated BFM shall form a viscous material that creates a high strength, porous, and erosion-resistant uniform, cohesive mat, when applied and dried. The bonding agent shall not dissolve or disperse upon re-wetting. BFM shall not inhibit the germination or growth of plant material.

#### **804.05.04.05 Erosion Control Blanket (ECB)**

ECB shall be of a consistent thickness with a 100% biodegradable even fibre distribution. The ECB shall be covered on top with a biodegradable and photodegradable plastic mesh. ECB may also be sewn together with cotton thread. ECB shall be supplied in a dry rolled mat protected with an outer waterproof wrap bearing the manufacturer's original label indicating product name and application instructions.

#### **804.05.05 Erosion Control Blanket (ECB) Staples**

ECB staples shall be u-shaped, constructed of wire with a diameter of at least 2.5 mm with legs at least 150 mm long and 25 mm apart.

#### **804.05.06 Water**

Water shall be free of any contaminants or impurities that would adversely affect the germination and growth of vegetation.

### **804.06 EQUIPMENT**

#### **804.06.01 Hydraulic Seeder and Mulcher**

The hydraulic seeder and mulcher shall be capable of mixing the materials into homogeneous slurry and maintaining the slurry in a homogeneous state until it is applied. The discharge pumps and gun nozzles shall be capable of applying the materials uniformly over the specified area. A hose extension for the hydraulic seeder and mulcher shall be on site and available for use for areas outside of the range of the gun nozzle.

#### **804.06.02 Straw Mulch Blower**

The straw mulch blower shall be capable of separating straw from the bales without chopping it into short lengths and applying the straw mulch in a uniform, cohesive mat.

When tackifiers are used, the straw mulch blower shall be capable of applying straw mulch and tackifiers simultaneously. The straw mulch blower shall be equipped with a minimum of two nozzles located inside the end of the blower pipe to coat the straw with the tackifier. Crimping may also be used to secure the straw mulch.

#### **804.06.03 Cyclone Spreader**

The cyclone spreader shall be capable of distributing seed and fertilizer uniformly in a dry state.

**804.07 CONSTRUCTION**

**804.07.01 Operational Constraints**

The seeding operation shall not commence until the Contract Administrator is in receipt of the Certificate of Seed Analysis for the seed being applied.

The seeding operation shall not commence until the Contract Administrator has approved the surface preparation, layout of permanent seed mix locations, and different cover types.

Seed and cover application or re-application shall not be carried out under adverse weather conditions such as high wind or heavy rain or when field conditions are not conducive to seed germination such as frozen soil or soil covered with snow, ice, or standing water.

The Contractor shall maintain the site and control erosion until final acceptance of the seed and cover.

Seed or cover shall not come in contact with the foliage of any trees, shrubs, or other vegetation, except as specified in the Seeding subsection. Seed or cover shall not come in contact with waterbodies.

BFM or FRM shall be installed by a Contractor certified and trained by the manufacturer in the proper mixing and installation of the product. To ensure a suitable drying and curing period, BFM and FRM shall not be applied when rainfall is expected, during rainfall, or immediately after rainfall.

**804.07.02 Surface Preparation for Seeding**

The surface to be seeded shall be prepared not more than 7 Days prior to the seeding operation.

At the time of seeding, all surface areas designated for seeding shall have a fine-graded uniform surface and shall exhibit no evidence of erosion. The surface shall be uniformly cultivated to a minimum depth of 50 mm and shall not have surface stones greater than 25 mm in diameter, foreign material, and weeds or other unwanted vegetation.

**804.07.03 Layout**

The locations and limits of the different permanent seed mixes and different cover types as specified in the Contract Documents shall be staked out on the ground surface.

**804.07.04 Seeding**

**804.07.04.01 Application Rates for Seed, Fertilizer, and Water**

Application rates for primary seed, nurse crop seed, and fertilizer shall be as shown in Table 2.

**804.07.04.02 Seed and Fertilizer Application**

Seed and fertilizer shall be applied prior to the application of cover.

Seed, fertilizer, and water shall be thoroughly mixed in the hydraulic seeder and mulcher into a homogeneous water slurry. When thoroughly mixed, the water slurry shall be applied to the prepared earth areas by the nozzle sprayer or extension hose.

The Contractor shall ensure that the seeding equipment is calibrated to provide the coverage shown in Table 2. The Contractor shall ensure there is a uniform dispersal of the mixed material over the entire area designated for seeding and that the spray does not dislodge soil or cause erosion.

Seed and fertilizer may also be applied separately by a cyclone spreader. Seeding shall overlap the adjoining ground cover by 300 mm.

#### **804.07.05 Cover Applications**

All cover materials shall be applied as a separate operation immediately following the application of seed and fertilizer.

The Contractor shall ensure that the hydraulic seeder and mulcher are properly calibrated to provide the coverage as specified for each of the hydraulically applied cover materials.

##### **804.07.05.01 Straw Mulch Application**

Straw mulch shall be applied to form a uniform, cohesive mat over 100% of the seeded earth area. The straw mulch shall be applied to a minimum depth of 25 mm and a maximum depth of 50 mm measured at the time of application.

##### **804.07.05.02 Hydraulic Mulch Application**

Hydraulic mulch shall be applied at the rate of 2,000 kg of dry product per 10,000 m<sup>2</sup>. Hydraulic mulch shall be thoroughly mixed with water into a homogenous slurry.

When thoroughly mixed, the hydraulic mulch slurry shall be applied to the seeded earth areas by nozzle sprayer or extension hose. The mixed material shall be evenly dispersed over the entire seeded earth area to form a uniform, cohesive mat. The spray shall not dislodge soil or cause erosion.

##### **804.07.05.03 Bonded Fibre Matrix (BFM) and Fibre Reinforced Matrix (FRM) Application**

BFM and FRM shall be applied at a minimum rate of 3,700 kg of dry product per 10,000 m<sup>2</sup>. BFM or FRM shall be mixed with water in a hydraulic seeder and mulcher at a rate of 20-30 kg of dry product to 500-600 litres of water to form a homogeneous slurry.

When thoroughly mixed, the BFM or FRM slurry shall be applied to the seeded earth areas by nozzle sprayer or extension hose. The BFM or FRM slurry shall be evenly dispersed in successive applications from different directions over the seeded earth area to form a uniform, cohesive mat. The spray shall not dislodge soil or cause erosion.

##### **804.07.05.04 Erosion Control Blanket (ECB) Application**

(ECB) shall be placed and stapled into position according to the manufacturer's installation instructions over the entire designated surface area. Blankets shall be installed in direct contact with the ground surface to form a uniform, cohesive mat over the seeded earth area. The Contractor shall ensure that the ECB is anchored to the soil and that tenting of the ECB does not occur.

On slopes, the uppermost edge of the ECB shall be anchored in a 150 mm wide by 150 mm deep trench when the ECB cannot be extended and anchored over the crest of the slope. The trench shall be backfilled with earth and compacted.

##### **804.07.06 Cleanup**

When seed and cover materials are applied to the foliage of trees, shrubs, other susceptible plant material, or waterbodies, the Contractor shall immediately remove the seed and cover materials from the areas and wash the areas with clean water.

When seed and cover materials are applied to areas or objects other than those designated, the Contractor shall remove the seed and cover materials.

**804.07.07 Management of Excess Material**

Management of excess material shall be as specified in the Contract Documents.

**804.07.08 Protection of Waterbodies and Waterbody Banks**

Protection of waterbodies and waterbody banks shall be as specified in the Contract Documents.

**804.08 QUALITY ASSURANCE**

**804.08.01 Performance Measure**

The Certificate of Seed Analysis shall be reviewed by the Contract Administrator to ensure compliance with the values shown in Table 1.

All seeded areas shall be inspected by the Contract Administrator using the Seeding and Cover Quality Assurance Visual Inspection Field Guide to ensure compliance with this specification at 30, 60, and 90-Day periods following the seeding and Cover operation.

At the 30-Day inspection within the seeded area:

- a) The applied cover shall be visually intact and shall form a uniform, cohesive mat.
- b) Germination of the nurse crop shall be visually evident.

At the 60-Day inspection within the seeded area:

- a) The nurse crop shall be evident at mature height in an evenly dispersed, uniform cover.
- b) Germination of the specified permanent seed species shall be visually evident in an evenly dispersed uniform cover.
- c) There shall not be any significant bare areas, both in terms of quantity and size.
- d) Non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

At the 90-Day inspection within the seeded area:

- a) The specified permanent seed species shall be at an average height of 50 mm in an evenly dispersed, uniform cover.
- b) There shall not be any significant bare areas, both in terms of quantity and size.
- c) Non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

Inspections shall not be made during the winter dormant period or when site conditions prohibit a visual field inspection. The timing intervals between inspections shall be suspended during the winter dormant period shown in Table 3.

**804.08.02 Failure to Meet Performance Measure**

If the values in the Certificate of Seed Analysis for the seeds supplied do not meet the values for seed germination, seed purity, and weed seed content shown in Table 1, the seed lot shall not be approved for use on the Contract and the Contractor shall supply a new seed lot and a new Certificate of Seed Analysis for approval prior to seeding.

If the values in the Certificate of Seed Analysis for the seeds supplied do not meet the values for seed species composition shown in Table 1, the Contractor shall supply a legible, valid copy of the seed mixing sheet from the seed supplier for approval by the Contract Administrator prior to seeding.

If the completed work does not meet the performance measures of the 30-Day inspection, the Contract Administrator shall document the failed areas, notify the Contractor of those areas, and re-inspect at the 60-Day inspection.

If the completed work does not meet the performance measures of the 60-Day inspection, the Contract Administrator shall notify the Contractor in writing of the failed areas. The Contractor shall re-apply the specified material in accordance with this specification within 14 Days of receiving the notification. The Contract Administrator shall re-inspect the seeded area at the 90-Day inspection.

If the completed work does not meet the performance measures of the 90-Day inspection, the Contract Administrator shall notify the Contractor in writing of the failed areas. The Contractor shall re-apply the specified material in accordance with this specification within 14 Days of receiving the notification. The Contract Administrator shall re-inspect the seeded area 30 Days after re-application of material.

Inspections and re-application of material shall continue, as outlined in the 90-Day inspection clause above, until the seeded area has been accepted.

All replaced seed and cover shall be subject to the Quality Assurance section of this specification.

#### **804.08.03 Dispute Resolution**

Dispute resolution only applies to the germination and growth of the permanent seed mix species.

Disputes arising from the performance measure evaluation shall be settled through referee testing using an actual live seedling count of the specified permanent seed mix species within the seeded earth area.

An independent consultant with experience in herbaceous plant identification shall perform the referee testing. Both parties shall agree on the selection of the independent consultant and both parties shall be bound by the consultant's evaluation.

The actual count shall be based on minimum germination requirements and minimum levels of acceptability to meet industry standards and federal legislation governing the testing, inspection, quality, and sale of seed.

To determine the number of seeds per unit of weight, published standard industry lists shall be referenced. When these lists show a range in the number of seeds per unit of weight, the mid-range number shall be used. When there is a difference in the estimated number of seeds by weight from one industry standard list to another, the lower figure shall be used.

To determine the germination rate for each seed species, the number of seeds per unit of weight is factored by the minimum germination rate of 70% in accordance with the Canada Seeds Act. A further 25% reduction is allowed to account for variation in seeding application, seedbed quality, seedbed preparation, and area cover.

The Contractor and the Owner may agree to use a simplified analysis, when instead of counting each seedling of each individual seeded perennial species of the mix, only the total number of seedlings of the mix is counted. If the parties cannot agree to the simplified analysis, the default method is a seedling count of each seeded perennial species.

The field inspection to determine the number of live plant seedlings should only be performed after the 90-Day inspection and when the seedlings reach an identifiable and measurable size.



The sampling procedure should be randomized over an area that both parties agree is representative of the seeded Contract. The selection and evaluation process is as follows:

- a) Select a representative area from the average seeded areas, eliminating the thinnest and thickest growth areas from the analysis.
- b) Measure its length and width. Use a random numbers table to generate five sets of X and Y axis coordinates from the area.
- c) Each axis coordinate is a sampling point. A sampling plot, or quadrat, is set out in a 200 x 1,000 mm plot with the axis coordinate becoming the lower right-hand corner of each quadrat.
- d) Each quadrat is divided into 20 sub-sampling units, each being 100 x 100 mm.
- e) The sub-sampling units are numbered from 1 to 20.
- f) Using a random numbers table, two of the twenty sub-sampling units are randomly selected.
- g) Live seedlings of each individual seeded perennial species of the mix are counted in the selected sub-sampling units to determine actual plant densities.
- h) An average seedling density per seeded perennial species, expressed as the number of seedlings per square metre is generated for each sampling plot or quadrat, based on the data from the two selected sub-sampling units.
- i) The procedure is repeated for the four other sampling points.
- j) The average number of seedlings per square metre for each of the seeded perennial species generated from the five sampling points is evaluated against the minimum industry standard benchmark for the seeded mix.

If the results of the referee testing prove that the seed and cover is unacceptable in meeting the minimum industry standard for germination, the Contractor shall then re-apply seed and cover in accordance with this specification to all areas under dispute. In addition, the Contractor shall be responsible for all costs associated with the dispute resolution process.

If the results of the referee testing prove that the seed and cover is acceptable in meeting the minimum industry standard for germination, the Owner shall then be responsible for all costs associated with the dispute resolution process.

**804.09 MEASUREMENT FOR PAYMENT**

**804.09.01 Actual Measurement**

**804.09.01.01 Seed and Mulch**

Seeding and mulch measurement shall be in square metres following the contours of the ground without any allowance for overlap.

**804.09.01.02 Seed and Erosion Control Blanket**

Seeding and erosion control blanket measurement shall be in square metres following the contours of the ground without any allowance for overlap.

**804.09.01.03                      Seed and Bonded Fibre Matrix (BFM) or Fibre Reinforced Matrix (FRM)**

Seed and BFM or RFM measurement shall be in square metres following the contours of the ground without any allowance for overlap.

**804.09.02                      Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**804.10                      BASIS OF PAYMENT**

- 804.10.01                      Seed and Mulch - Item**
- Seed and Erosion Control Blanket - Item**
- Seed and Bonded Fibre Matrix or Fibre Reinforced Matrix - Item**

Payment at the Contract price for the above tender items shall be full compensation for all the labour, Equipment, and Material to do the work.

**TABLE 1**  
**Permanent Seed Mixes and Seed Certificate Analysis Values**

<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
<b>Standard Roadside Mix</b>	<b>Canada #1 Lawn Grass Seed Mixture</b>	<b>70</b>	<b>85</b>	<b>0.5</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					50	50 to 60
Kentucky Bluegrass: <i>Poa pratensis</i>					10	25 to 30
Perennial Ryegrass: <i>Lolium perenne</i>					35	12 to 18
White Clover: <i>Trifolium repens</i>					5	2 to 4
<b>Crown Vetch Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					66	62 to 70
Crown Vetch: <i>Coronilla varia</i> inoculated seed					34	30 to 38
<b>Birdsfoot Trefoil Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					66	62 to 70

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<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
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Birdsfoot Trefoil 'Leo': <i>Lotus corniculatus</i> 'Leo inoculated seed					34	30 to 38
<b>Salt Tolerant Mix</b>	<b>Canada #1 Ground Cover Mixture</b>	<b>70</b>	<b>85</b>	<b>3.0</b>		
Tall Fescue: <i>Festuca arundinacea</i>					25	20 to 30
Fults Alkali Grass: <i>Puccinellia distans</i>					20	15 to 25
Creeping Red Fescue: <i>Festuca rubra</i>					25	15 to 25
Perennial Ryegrass: <i>Lolium perenne</i>					20	15 to 25
Hard Fescue: <i>Festuca trachyphylla</i>					10	10 to 15
<b>Lowland Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					35	40 to 50
Brome Grass: <i>Bromus nerris</i>					25	20 to 30
Kentucky Bluegrass: <i>Poa pratensis</i>					10	10 to 20

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<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
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Birdsfoot Trefoil 'Leo': <i>Lotus corniculatus</i> 'Leo' inoculated seed					5	3 to 7
White Clover: <i>Trifolium repens</i>					5	3 to 7
Perennial Ryegrass: <i>Lolium perenne</i>					20	3 to 7
<b>Acidic Soil Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Birdsfoot Trefoil 'Leo', <i>Lotus corniculatus</i> 'Leo' inoculated seed					30	30 to 40
Red Top: <i>Agrostis gigantea</i>					10	20 to 30
Tall Fescue: <i>Festuca arundinacea</i>					15	15 to 20
Creeping Red Fescue: <i>Festuca rubra</i>					30	7 to 12
Hard Fescue: <i>Festuca trachyphylla</i>					5	3 to 7
Alsike Clover: <i>Trifolium hybridum</i>					5	3 to 7
Red Clover: <i>Trifolium pratense</i>					5	3 to 7

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<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
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<b>Northern Ontario Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Red Top: <i>Agrostis gigantea</i>					10	35 to 40
Timothy: <i>Phleum pratense</i>					10	10 to 20
Creeping Red Fescue: <i>Festuca rubra</i>					30	10 to 15
Birdsfoot Trefoil: <i>Lotus corniculatus</i> 'Leo" inoculated seed					5	6 to 10
Alsike Clover: <i>Trifolium hybridum</i>					3	3 to 7
White Clover: <i>Trifolium repens</i>					2	3 to 7
Bromegrass: <i>Bromus nerrer</i>					20	1 to 5
Hard Fescue: <i>Festuca trachyphylla</i>					10	1 to 5
Meadow Fescue: <i>Festuca pratensis</i>					10	1 to 5

**TABLE 2**  
**Application Rates for Seed and Fertilizer**

Permanent Seed Mixes	Permanent Seed Mix Rate kg/10,000 m <sup>2</sup>	Fertilizer Rate minimum 200 kg/ha			Nurse Crop Rate kg/10,000 m <sup>2</sup>
		8-32-16	0-46-0	0-0-60	
Standard Roadside Mix	130	350	-	-	60
Crown Vetch Mix	100	350	250	-	60
Birdsfoot Trefoil Mix	100	350	250	-	60
Salt Tolerant Mix	130	350	-	-	60
Lowland Mix	130	350	-	-	60
Acidic Soil Mix	130	350	200	200	60
Old Field Mix	100	350	-	-	60

**TABLE 3**  
**Winter Dormant Period**

SOUTHWESTERN ONTARIO	SOUTHERN ONTARIO	NORTHERN ONTARIO
That area of Ontario south of a line joining Grand Bend and Clarkson.	That area of Ontario between the northern and southern boundaries of Southwestern Ontario and Northern Ontario respectively.	That area of Ontario north of a line joining Waubauskene, Severn Bridge, Bancroft, and Ottawa.
November 15 to April 15 inclusive	November 1 to April 30 inclusive	October 15 to May 15 inclusive

**Appendix 804-A, November 2014  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The following should be specified in the Contract Documents:

- Permanent seed mixes. (804.05.01.04)

The designer may select the appropriate seed mix and cover type application from Tables A-1 and A-2 included in this appendix. The designer may propose new site specific seed mixes to suit existing conditions that require a different seed than those specified.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**APPENDIX TABLE A-1  
Permanent Seeding Mix Types**

<b>Permanent Seed Mixes</b>	<b>Seed Mix Attributes</b>	<b>Selection Criteria</b>
Standard Roadside Mix	A tested mix of hardy roadside perennial grasses that have performed well in highway situations.	This mix should be the default seed mix for most roadside seeding work.
Crown Vetch Mix	A blend of a hardy legume and a hardy turfgrass. The turfgrass provides control and top growth until the Crown Vetch plants grow and develop after several seasons. Crown Vetch produces a mass of purple flowers in season and is a vigorous ground cover.	This mix is primarily used to revegetate slope areas when erosion and soil fertility may be a problem. There have been some concerns over its ability to spread and crowd out indigenous growth and its non-native status.
Birdsfoot Trefoil Mix	A blend of another hardy legume and a hardy turfgrass. Very similar growth characteristics to the Crown Vetch mix, except a little slower growing, less vigorous, and Trefoil has masses of yellow flowers in season.	As with Crown Vetch, this mix is primarily used to revegetate slope areas when erosion and soil fertility may be a problem. It is hardier in the north than Crown Vetch and is not as aggressive in growth and habit.
Salt Tolerant Mix	The salt tolerant mix is a blend mixture of several turfgrass species with a proven resistance to salt.	The salt tolerance mix should be specified in areas such as medians, shoulder strips, and shoulder ditches, when salt is thought to be in heavier concentrations.
Lowland Mix	The lowland mix was developed with several species of turfgrasses that grow well in low-lying wet areas.	The lowland mix should be specified along waterbody edges in low-lying areas when light seasonal flooding is a possibility.
Acidic Soil Mix	The acidic soil mix was developed to provide adequate vegetative cover on areas of low fertility and high acidity.	The acidic soil mix should be used in areas of low fertility, medium to high acidity, and in the northern areas of the province.
Northern Ontario Mix	This mix is designed to suit the limited topsoil conditions and acidity of Northern Ontario sites.	Old field should be selected when there will be fallow areas left alone with little or no maintenance, no mowing, and the area will be required to be self-sustaining. More suitable in rural areas than urban or suburban.

**APPENDIX TABLE A-2  
Seeding Cover Application Types**

<b>Cover Application Types</b>	<b>Cover Type Attributes</b>	<b>Selection Criteria</b>
Straw	Chopped straw is applied to the seeded area via a straw mulch blower and is coated with a tackifier or crimped to hold it together. A time-tested method of providing cover and protection for germinating seedlings, as well as short-term erosion control.	One of the default cover types. Straw has the advantage of being relatively cheap and providing good coverage. Straw cover application requires another piece of equipment and a labour intensive second application to properly apply the cover material.
Hydraulic Mulch	Hydraulic mulch is a processed fibre of wood, straw, cotton, cellulose pulp, or any combination of these materials. Hydraulic mulches provide a uniform absorptive mat that allows moisture to penetrate into the underlying soil, while providing cover for the germinating seed.	Hydraulic mulch is the other default mulch. It has the advantage of being easy to apply, using the same equipment when applying seed and fertilizer. It is low-cost and low-labour. Hydraulic mulch does not give the same degree of protection to the germinating grass as straw does. During extremes of temperature and moisture, it will not perform as well as straw or other higher levels of erosion control.
Erosion Control Blanket (ECB)	ECBs are a family of products that are supplied in rolls. They are unrolled over the seeded earth area and stapled in place. ECBs provide a higher level of erosion control and protection for germinating seedlings. ECBs are machine woven mats with a variety of materials sandwiched between the two woven layers. Materials can be wood, coco or cotton fibre, straw, or any combination depending upon manufacturer.	ECBs should be specified in the contract preparation stage and not during construction. ECBs are specified on a project when erosion of soil slopes or soil ditches is expected to be a problem. ECBs have an advantage over hydraulic mulch in that the blanket is firmly attached to the underlying soil by staples, it is longer lasting, and provides a superior growth medium for seedlings. It is more expensive and improper installation can result in poor end results leading to surface erosion.
Bonded Fibre Matrix (BFM)	BFM is a hydraulically applied product made of wood, cotton, or cellulose pulp fibres. The fibres are bonded together by various means including mineral bonding agents or organic tackifiers. When applied, the BFM forms a viscous material that upon drying creates a high strength, porous, and erosion resistant mat.	BFMs are applied like hydraulic mulches and have a great similarity to hydraulic mulches, except BFMs have greater erosion resistance and create a thicker, firmer mat. BFMs should be specified when erosion of soil slopes or soil ditches is expected to be a problem and when hydraulic seeders can get access. BFMs are specified in the design stage and have also been substituted for ECBs during construction, although usually at the Contractor's request.
Fibre Reinforced Matrix (FRM)	FRM is a hydraulically applied product made of pasteurized wood fibers, dispersible synthetic fibers, and soil-bonding agents. When applied, the FRM forms a viscous material that dries quickly and locks up within one hour. Upon drying the product provides increased flexibility and loft for impact resistance, air circulation, and moisture retention that promotes seed germination and plant growth.	FRMs are applied like hydraulic mulches and have a great similarity to hydraulic mulches, except differ from BFMs in that they cure within two hours, have superior cover factor and vegetation establishment. The functional longevity is up to 18 months. Due to the thickness, the product provides superior terrain protection, even during hard rains. This product can be used for any slopes, including 1H:1V.



## CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES

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### APPENDICES

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#### 805.01 SCOPE

This specification describes the requirements for the installation, maintenance, and removal of temporary erosion and sediment control measures.

##### 805.01.01 Specification Significance and Use

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **805.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **805.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206	Grading
OPSS 517	Dewatering
OPSS 804	Seed and Cover

### **Ontario Provincial Standard Specifications, Material**

OPSS 1004	Aggregates - Miscellaneous
OPSS 1801	Corrugated Steel Pipe Products
OPSS 1840	Non-Pressure Polyethylene Plastic Pipe Products
OPSS 1860	Geotextiles

### **Canadian and Provincial Statutes**

Ontario Water Resources Act, R.S.O. 1990, c. 0.40

### **Canadian General Standards Board (CGSB)**

148.1 No 7.3-92	Methods of Testing Geosynthetics and Geomembranes - Grab Tensile Test for Geotextiles
148.1 No 10-94	Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size

## **805.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Diversión Ditch** means a temporary channel to intercept and convey overland flow away from areas of disturbed or erodible soil and to minimize erosion of slopes from sheet flow.

**Earth** means as defined in OPSS 206.

**Erosion** means the physical removal or detachment of soil particles from an earth surface, followed by the transport of detached particles to another location by the action of a mobile agent including rain, flowing water, wind, equipment and vehicles.

**Fibre Roll** means an assembled or commercially available flexible, tubular structure that provides sediment control and may provide run-off filtration and includes wattles, filter socks and filter berms.

**High Water Level** means the highest point on the bank or floodplain of a waterbody where the water level reaches during high flow events or periods.

**Riparian Vegetation** means vegetation within 30 m of a waterbody.

**Sediment** means soil particles detached from an earth surface by erosion.

**Waterbody** means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

**Waterbody Bank** means the slope on or adjacent to a waterbody from the normal water level to the top of slope.

**Watercourse** means a stream, creek, river, or channel including ditches, in which the flow of water is permanent, intermittent, or temporary.

## **805.05 MATERIALS**

### **805.05.01 Straw and Straw Bales**

Straw shall be either wheat or oat straw.

Straw bales shall be dry and firm, be tied tightly in at least two places, show no evidence of straw or tie decay, and be free of sediment. They shall be of agricultural, rectangular formation and dimensions, as specified in the Contract Documents.

### **805.05.02 Geosynthetics**

#### **805.05.02.01 Geotextile**

Geotextile shall be free of holes, tears, and punctures.

#### **805.05.02.02 Silt Fence Geotextile**

Geotextile for silt fence shall be according to OPSS 1860, Table 3.

Geotextile for silt fence may be separate from the stakes used to install it as a sediment barrier.

**805.05.02.03 Berm Barrier and Rock Flow Check Dam Geotextile**

Geotextile for berm barriers and rock flow check dams shall be a woven, Class II geotextile according to OPSS 1860. The filtration opening size (FOS) shall be no greater than 300 µm.

**805.05.02.04 Turbidity Curtain Geosynthetic**

Turbidity curtain geosynthetics shall have a grab tensile strength of at least 990 N, meeting CAN/CGSB 148.1, No. 7.3 and be one of geotextile or geomembrane.

Geotextile shall be a woven material. The filtration opening size (FOS) shall be no greater than 300 µm, meeting CAN/CGSB 148.1, No. 10.

Geomembrane shall be a low-permeability synthetic material or a geotextile impregnated with elastomeric spray.

**805.05.02.05 Filter Bags**

Geotextile for filter bags shall be non-woven, polypropylene, Class I according to Table 1 of OPSS 1860 unless otherwise specified in the Contract Documents.

**805.05.03 Plastic Sheeting**

Plastic sheeting used to wrap berm barriers or other sediment control measures shall be 6 mm polyethylene of maximum available width.

**805.05.04 Stakes**

Stakes shall be of sufficient strength and length to satisfy control measure installation, performance and maintenance requirements.

**805.05.05 Control Measure Support**

Control measure support for heavy-duty silt fence barrier shall be a separate product or one bonded to silt fence geotextile and be either plastic snow fence mesh, 0.81 mm diameter galvanized wire mesh or 1.63 mm diameter galvanized steel fence with a 5 cm by 10 cm weave and a 0.91 m height.

When a heavy-duty silt fence barrier is installed using a product manufactured with the control measure support bonded to the geotextile it shall be installed with the geotextile on the upstream side or front of the control measure support.

**805.05.05.01 Posts**

Posts to support heavy duty wire-backed silt fence barriers shall be metal T-posts. Metal ties shall be used to secure the silt fence to the metal T-posts.

**805.05.06 Berm Barriers**

Berm barriers shall be constructed using earth, sand, gravel, brush or compost.

**805.05.07 Sandbags**

Sandbags shall be made from heavy gauge plastic, agricultural burlap, or silt fence geotextile. Heavy gauge plastic shall contain stabilizers or inhibitors resistant to deterioration by ultraviolet radiation. Sandbags shall be filled with clean sand, 19 mm gravel or 6 mm pea gravel, containing no silt or clay.

**805.05.08                      Fibre Rolls**

Fibre rolls shall be of a consistent internal thickness with even fibre distribution throughout the roll.

Fibre rolls shall be covered on the outside with an open-weave, biodegradable and photodegradable mesh or netting that securely contains the fibres within the rolls.

Fibre rolls shall be filled with 100% organic, biodegradable material such as shredded straw, wood fibres or compost and may contain seed.

**805.05.09                      Turbidity Curtain Hardware**

**805.05.09.01                  Floatation**

Turbidity curtain floatation shall be a material that has sufficient buoyancy to provide the curtain with continuous support, and a minimum of freeboard as specified in the Contract Documents.

**805.05.09.02                  Load Lines**

Turbidity curtain load lines shall be 8 mm diameter steel cable or 19 mm diameter nylon or polypropylene rope.

**805.05.09.03                  Ballast**

Turbidity curtain ballast shall be 8 mm steel chain.

**805.05.09.04                  Anchors**

Turbidity curtain anchors shall be mushroom or kedge anchors with a minimum mass of 34 kg for firm mud bottoms or self-burying anchors with a minimum mass of 5 kg for sandy bottoms.

**805.05.09.05                  Mooring Buoys**

Turbidity curtain mooring buoys shall have provision for the mooring line to be securely attached and be sufficiently buoyant to remain afloat under normal load conditions.

**805.05.09.06                  Mooring Lines**

Turbidity curtain mooring lines shall be 19 mm diameter nylon or polypropylene rope.

**805.05.09.07                  Adjustment Lines**

Turbidity curtain adjustment lines shall be 13 mm diameter nylon or polypropylene rope.

**805.05.10                      Rock**

Rock for rock flow check dams shall be according to the requirements for rip-rap and gabion stone according to OPSS 1004.

**805.05.11                      Corrugated Pipe**

Corrugated pipe slope drains shall be non-perforated, corrugated steel pipe according to OPSS 1801 or polyethylene plastic pipe according OPSS 1840. Pipe diameter shall be as specified in the Contract Documents.

**805.05.12 End Sections**

End sections for the inlet and outlet of slope drains shall be according to OPSS 1801, regardless of the material type of the pipe used.

**805.05.13 Erosion Control Blankets**

Erosion control blankets for diversion ditches shall be as specified in OPSS 804.

**805.07 CONSTRUCTION**

**805.07.01 Operational Constraints**

**805.07.01.01 Retention of Riparian Vegetation**

The area over which vegetation is removed on site shall affect no more than one third (1/3) of the total woody vegetation in the right-of-way within 30 m of the high water level of any waterbody unless otherwise specified in the Contract Documents.

**805.07.01.02 Protection of Stockpiled Materials**

All stockpiles of erodible construction materials and excess or surplus materials shall be protected from erosion and sediment transport within 48 hours of being built unless otherwise specified in the Contract Documents.

**805.07.01.03 Dewatering**

Dewatering effluent shall be controlled to prevent passage of sediment into waterbodies and other sensitive environmental features as specified in the Contract Documents or onto adjacent properties. Discharge of dewatering effluent to sediment traps for dewatering shall be controlled to avoid exceeding trap capacity and to prevent scour and washout.

Discharge of water from sediment traps for dewatering shall be according to OPSS 517.

**805.07.01.04 Slope Drains**

When slope drains are specified in the Contract Documents, the slope drain and associated berm barrier shall be constructed in the same day.

**805.07.01.05 Turbidity Curtains and Cofferdams**

Equipment shall not be operated in a waterbody outside a turbidity curtain or cofferdam other than hand held equipment or boats.

**805.07.01.06 Construction and Removal of Measures**

The construction and removal times for temporary erosion and sediment control measures shall be as specified in the Contract Documents.

**805.07.02 Light-Duty Sediment Barriers, General**

Light-duty sediment barriers are light-duty straw bale barriers, light-duty silt fence barriers, or light duty fibre roll barriers.

Light-duty sediment barriers shall be constructed as specified in the Contract Documents.



Light-duty sediment barriers shall not be installed in or across waterbodies.

When the Light-Duty Sediment Barriers item is specified in the Contract Documents, any light-duty sediment barriers may be used. When a specific light-duty sediment barrier is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Light-duty sediment barriers shall include protection placed against the downslope side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

#### **805.07.02.01 Light-Duty Straw Bale Barriers**

Light-duty straw bale barriers shall be constructed as specified in the Contract Documents.

When specified to be installed around catch basins, straw bales shall be placed completely around catch basins and ditch inlets without gaps. When a double row of straw bales is specified in the Contract Documents, the straw bales shall be placed such that the joints between the straw bales of each row are not in-line with the joints of the straw bales of the adjacent row.

Stakes securing the bales shall be driven through the bales without breaking the bale ties or otherwise disturbing bale firmness and shape.

Maintenance shall include the replacement of each bale at intervals not exceeding 45 Days.

#### **805.07.02.02 Light-Duty Silt Fence Barriers**

Light-duty silt fence barriers shall be constructed as specified in the Contract Documents.

Light-duty silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Light-duty silt fence barriers shall be installed within a trench excavated along the contour of the ground such that the elevation of the above ground portion of the fence is the same along its entire length except at the ends. Light-duty silt fence barriers shall be installed without breaks or gaps along their entire length. Light-duty silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another light-duty silt fence barrier shall be installed as specified in the Contract Documents.

The geotextile shall be attached firmly, without sagging, to the upslope side of the stakes. Stakes shall be spaced to ensure the geotextile remains vertical. Where the geotextile is joined to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to the stakes using cable ties or soft wire at the top of the geotextile only. The geotextile shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

When geotextile is supplied without stakes attached, the geotextile shall be installed into the trench in the ground first, the stakes shall be driven into the ground behind the geotextile, and the geotextile shall be attached to the upslope side of the stakes using cable ties or soft wire at the top of geotextile only.

#### **805.07.02.03 Light-Duty Fibre Roll Barriers**

Light-duty fibre roll barriers shall be sized and constructed as specified in the Contract Documents.

Light-duty fibre roll barriers shall be installed along the contour of the ground into trenches that have been excavated into the soil perpendicular to the slope face to a depth of approximately one half the roll diameter and width across the width of the slope.

Any rills and gullies shall be filled in where light-duty fibre roll barriers are to be installed. Light-duty fibre roll barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another light-duty fibre roll barrier shall be installed tightly butted against the first one.

Light-duty fibre roll barriers shall be installed so that their base is in continuous contact with the underlying soil along their entire length without gaps and angled upslope at each end run in a "J" pattern. The ends of adjacent fibre roll segments shall be tightly butted against each other and shall not be overlapped vertically or horizontally.

A metal bar shall be used to make pilot holes perpendicular to the slope face through the centre of the fibre rolls as specified in the Contract Documents. Pilot holes shall also be made at the ends of each fibre roll segment angled towards the next abutting fibre roll to hold adjacent rolls together.

Wooden stakes shall be driven into the pilot holes as specified in the Contract Documents.

Soil excavated from the trenches shall be placed along the upslope side of the fibre rolls and compacted into the front of the trench to minimize possible undermining by runoff.

The soil on the upslope and downslope sides of the fibre rolls shall be seeded according to OPSS 804.

### **805.07.03 Heavy-Duty Sediment Barriers, General**

Heavy-duty sediment barriers are heavy-duty silt fence barriers, heavy-duty wire-backed silt fence barriers, berm barriers, or sandbag barriers.

Heavy-duty sediment barriers shall be constructed as specified in the Contract Documents, without gaps and without undermining to prevent sediment passage through, under, or around the barrier.

When heavy-duty sediment barriers are specified in the Contract Documents, the Contractor has the option to select any of the heavy-duty sediment barriers or any combination of them. When a specific heavy-duty sediment barrier is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Heavy-duty silt fence barriers shall include control measure support placed against the downstream side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

#### **805.07.03.01 Heavy-Duty Silt Fence Barriers**

Heavy-duty silt fence barriers shall be constructed as specified in the Contract Documents.

Heavy-duty silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Heavy-duty silt fence barriers shall be installed within a trench excavated along the contour of the ground such that the elevation of the bottom of the fence is the same along its entire length except at the ends. Heavy-duty silt fence barriers shall be installed without breaks or gaps along their entire length. Heavy-duty silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another heavy-duty silt fence barrier shall be installed as specified in the Contract Documents.

The geotextile shall be attached firmly to the upstream side of the control measure support and the stakes. Stakes shall be spaced to ensure the geotextile and the control measure support remains vertical. Where the geotextile or the control measure support is joined to itself to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to stakes using wire ties

at the top of the geotextile or the control measure support only. The geotextile and control measure support shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

When geotextile is supplied without the control measure support or stakes attached, the control measure support shall be installed into the trench in the ground first, the geotextile shall be installed into the trench on the upslope side of the control measures support, the stakes shall be driven into the ground behind the geotextile and the control measure support, and the geotextile and control measure support shall be attached to the stakes using wire ties at the top of the geotextile and control measure support and only.

#### **805.07.03.02 Heavy-Duty Wire-Backed Silt Fence Barriers**

Heavy-duty wire-backed silt fence barriers shall be constructed as specified in the Contract Documents.

Heavy-duty wire-backed silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Heavy-duty wire-backed silt fence barriers shall be installed in a trench excavated along the contour of the ground such that the elevation of the bottom of the fence is the same along its entire length except at the ends. Heavy-duty wire-backed silt fence shall be installed without breaks or gaps along their entire length. Heavy-duty wire-backed silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another heavy-duty wire-backed silt fence barrier shall be installed as specified in the Contract Documents.

The wire control measure support shall be installed into the trench in the ground. The geotextile shall be installed into the trench on the upslope side of the wire control measure support. T-posts shall be installed into the ground behind the geotextile and wire control measure support and spaced to ensure the geotextile and wire control measure support remain vertical. The geotextile and the wire control measure support shall be attached securely to the T-posts using wire ties at the top of the geotextile and wire control measure support only. Where the geotextile or the wire control measure support is joined to itself to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to T-posts using wire ties at the top of the geotextile or wire control measure support only. The geotextile wire control measure support shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

#### **805.07.03.03 Berm Barriers**

Berm barriers shall be constructed and wrapped in geotextile or plastic sheeting as specified in the Contract Documents. The geotextile or plastic sheeting shall be secured to the ground.

#### **805.07.03.04 Sandbag Barriers**

Sandbags shall be securely tied at the top.

Sandbag barriers shall be constructed as specified in the Contract Documents

Sandbags within each row shall be placed with the sides of the bags butted tightly against one another without gaps. The ends of sandbags in adjacent rows shall be butted tightly against one another without gaps.

When sandbag barriers are constructed on earth surfaces, the trench into which the sandbags are placed shall be backfilled around the sandbags to existing grade and compacted.

When sandbag barriers are to be constructed on sod, erosion control blanket, existing turf, or bedrock, they shall be placed so there are no gaps between the sandbags and the underlying surface.

Sandbag barriers shall be maintained with undamaged bags that are firmly seated.

#### **805.07.04 Fibre Roll Grade Breaks**

Fibre roll grade breaks shall be constructed as specified in the Contract Documents.

Fibre rolls shall be installed horizontally starting from the toe of the slope and working up to the top of the slope. Any rills and gullies on the slope face shall be filled in as the fibre rolls are installed.

Fibre rolls shall be installed along the contour of the ground into trenches that have been excavated into the soil perpendicular to the slope face and width across the slope.

Fibre rolls shall be installed so that their base is in continuous contact with the underlying soil along their entire length without gaps and angled upslope at each end run in a "J" pattern. The ends of adjacent fibre roll segments shall be tightly butted up against each other and shall not be overlapped vertically or horizontally.

A metal bar shall be used to make pilot holes perpendicular to the slope face through the centre of the fibre rolls as specified in the Contract Documents. Pilot holes shall also be made at the ends of each fibre roll segment angled towards the next abutting fibre roll to hold adjacent rolls together.

Wooden stakes shall be driven into the pilot holes perpendicular to the slope face to secure the fibre rolls to the slope along their entire length. Additional stakes shall be driven into the fibre rolls along the downslope side at every grade change or if soils are very loose and uncompacted or the slope is steep.

Soil excavated from the trenches shall be placed along the upslope side of the fibre rolls and well compacted into the front of the trench to minimize possible undermining by runoff.

The soil on the upslope and downslope sides of the fibre rolls shall be seeded as specified in the Contract Documents.

#### **805.07.05 Flow Check Dams - General**

Flow check dams are straw bale flow check dams, fibre roll flow check dams, sandbag flow check dams, or rock flow check dams.

Flow check dams shall be constructed as specified in the Contract Documents such that the spillway level of the downstream flow check dam is the same as the base of the upstream flow check dam when they are specified in series. Flow check dams shall be constructed without gaps and without undermining to prevent sediment passage through, under, or around the flow check dam.

When the Flow Check Dams item is specified in the Contract Documents, any of the flow check dams or any combination of them may be used. When a specific flow check dam is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Flow check dams shall include protection placed against the downstream side at the lowest point of the flow check dam so that any overflow of the flow check dam is prevented from causing soil scour and erosion.

#### **805.07.05.01 Straw Bale Flow Check Dams**

Straw bale flow check dams shall be constructed as specified in the Contract Documents and shall be replaced every 45 days.

**805.07.05.02 Fibre Roll Flow Check Dams**

Fibre roll flow check dams shall be constructed as specified in the Contract Documents.

**805.07.05.03 Sandbag Flow Check Dams**

Sandbag flow check dams shall be constructed as specified in the Contract Documents.

**805.07.05.04 Rock Flow Check Dams**

Rock flow check dams shall be constructed as specified in the Contract Documents.

**805.07.06 Sediment Traps**

Sediment traps shall be constructed as specified in the Contract Documents to prevent sediment passage from the upstream to the downstream side of the trap and so that the majority of the sediment is collected in the excavated basin.

Sediment traps shall be constructed as a single control measure consisting of an excavated basin and a rock flow check dam.

A temporary fence shall be erected around the sediment trap to restrict public access.

**805.07.07 Slope Drains**

Slope drains shall be constructed as specified in the Contract Documents.

Slope drains shall be constructed as a single control measure consisting of a corrugated pipe, two end sections including an inlet and an outlet, and a sediment trap constructed at the outlet end of the pipe.

The pipe inlet shall be placed through a berm barrier in such a manner that flow is directed to the pipe inlet without scouring of the berm. The toe plate of the inlet end section shall be fully imbedded into the ground surface.

Pipes shall be maintained in place without gaps and without undermining so that water is conveyed from the upstream side of the berm and collected in the sediment trap.

**805.07.08 Diversion Ditches**

Diversion ditches shall be constructed as specified in the Contract Documents.

When diversion ditches are specified to be lined with rolled erosion control blanket along their entire length it shall be according to OPSS 804.

Flow check dams shall be installed at regular intervals along the entire length of diversion ditches as specified in the Contract Documents.

Where diversion ditches are specified to be lined with rip-rap or granular it shall be according to OPSS 1004.

**805.07.09 Sediment Traps for Dewatering**

Sediment traps for dewatering shall be constructed as specified in the Contract Documents.

Sediment traps for dewatering shall be constructed a minimum of 30 m away from waterbodies or as far away as practicable from the top of the bank of any waterbody.

The shape of the excavated basin may be varied to suit the characteristics of the area surrounding it.

The sediment barrier and rock flow check dam shall be constructed as specified in the Contract Documents.

Construction of the sediment barrier shall be according to the requirements for light-duty sediment barriers with the following exceptions:

- a) End runs are not required.
- b) The rock flow check dam shall be located at the low point of the light-duty sediment barrier.

A temporary fence shall be erected around the sediment trap to restrict public access.

Discharge of water from sediment traps for dewatering shall be according to OPSS 517.

#### **805.07.10 Filter Bags**

Filter bags, hoses and pumps shall be sized appropriately to the volume as specified in the Contract Documents of water to be filtered. Bags shall have a FOS as specified in the Contract Documents.

Filter bags shall be situated in a vegetated area or placed on a permeable surface on a slight slope with the opening of the bag facing upslope a minimum of 30 m away from waterbodies or as far as practicable from the top of the bank of any waterbody.

The opening of the filter bag shall be securely attached with mechanical connections to the discharge hose using commercially available hose couplers and placed in the retention facility to be dewatered.

Discharge of water from filter bags shall be according to OPSS 517.

#### **805.07.11 Turbidity Curtains**

Turbidity curtains shall be constructed as specified in the Contract Documents. Turbidity curtains shall be free of tears and gaps, and the bottom edge of the curtain shall be continuously in contact with the waterbody bed so that sediment passage from the enclosed area is prevented.

Turbidity curtains shall be constructed according to the following:

- a) Breaks may be made in the lower sleeve to facilitate pulling of the ballast, provided they are a maximum 100 mm in size and spaced at minimum 3 m intervals.
- b) Where turbidity curtain geosynthetic is joined to provide a continuous run, the sections shall be connected to provide a continuous seal to prevent the escape of turbid water between the sections.
- c) The turbidity curtain shall be of sufficient width to account for water depth and wave action.
- d) The turbidity curtain shall be prepared for installation by furling and tying securely with furling ties every 1.5 m for the entire length of the curtain.
- e) Anchor locations shall be established as necessary to maintain the turbidity curtain in place and functioning.

The sequence of installation shall be according to the following:

- a) Tie-downs shall firmly anchor the turbidity curtain to the shoreline.

- b) One end of the furled curtain shall be firmly attached to the upstream tie-down.
- c) The furled curtain shall be launched and placed.
- d) The other end of the furled curtain shall be attached to the downstream tie-down.
- e) Each anchor shall be attached to the turbidity curtain load line with a mooring line.
- f) Mooring buoys shall be attached to the mooring line at a distance of 1 m from the load line to keep the turbidity curtain in place at locations where it changes direction.
- g) The furling ties shall be released to allow the turbidity curtain ballast to sink to its maximum depth.
- h) The location and depth of the ballast shall be adjusted as necessary using the adjustment lines.

Equipment is permitted in the working area enclosed by the turbidity curtain.

Folds in the turbidity curtain that form next to the floatation collar shall be regularly monitored and cleared of collected sediment.

#### **805.07.12 Cofferdams**

Cofferdams shall be constructed as specified in the Contract Documents to:

- a) Isolate the working area from the waterbody.
- b) Prevent the release of sediment and debris into the surrounding waterbody.

Equipment is permitted in the working area enclosed by the cofferdam.

#### **805.07.13 Monitoring**

All temporary erosion and sediment control measures shall be monitored to ensure they are in effective working order. Monitoring shall be once a week, at minimum, prior to any forecast rain event and following any rain event.

#### **805.07.14 Maintenance**

All temporary erosion and sediment control measures constructed under this specification shall be maintained in an effective, functioning, stable condition.

#### **805.07.15 Sediment Removal**

The work shall consist of the removal and management of accumulated sediment.

Sediment that is accumulated by the temporary erosion and sediment control measures shall be removed in a manner that avoids escape of the sediment to the downstream side of the control measure and avoids damage to the control measure. Sediment shall be removed to the level of the grade existing at the time the control measure was constructed and be according to the following:

- a) For light-duty sediment barriers and flow check dams, accumulated sediment shall be removed once it reaches the lesser of the following:
  - i. A depth of one-half the effective height of the control measure. For flow check dams, the effective height shall be determined relative to the lowest point of the flow check dam.
  - ii. A depth of 300 mm immediately upstream of the control measure.

- b) For heavy-duty sediment barriers, sediment traps, and sediment traps for dewatering, accumulated sediment shall be removed once it reaches one-half the effective height or depth of the control measure.
- c) For all control measures, accumulated sediment shall be removed as necessary to perform maintenance repairs.
- d) Accumulated sediment shall be removed immediately prior to the removal of the control measure.

#### **805.07.16 Control Measure Removal**

Ditch, permanent slope, and any other embankment cover specified elsewhere in the Contract Documents to be placed within the area controlled by the temporary erosion and sediment control measure shall be in place and established prior to the removal of such control measure.

Temporary erosion and sediment control measures shall be removed and associated excavations backfilled and compacted when the measures are no longer required.

Temporary erosion and sediment control measures shall be removed in a manner that:

- a) Prevents entry of equipment, other than hand-held equipment or boats, to any waterbody.
- b) Prevents release of sediment and debris to any waterbody.

Prior to removal of the in-water control measures, the area enclosed by turbidity curtains and cofferdams shall be cleaned of all debris. For cofferdams, accumulated sediment shall be removed prior to removal of the sediment control measure.

Any seeding and mulching, temporary cover, sod, other surface application, or original turf cover disturbed by removal or backfilling of erosion and sediment control measures and removal of accumulated sediment, shall be brought to final grade and restored as specified in the Contract Documents.

#### **805.07.17 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

#### **805.07.18 Protection of Waterbodies and Waterbody Banks**

Protection of waterbodies and waterbody banks shall be as specified in the Contract Documents.



**805.09 MEASUREMENT FOR PAYMENT**

**805.09.01 Actual Measurement**

- 805.09.01.01**
  - Light-Duty Sediment Barriers**
  - Light-Duty Straw Bale Barriers**
  - Light-Duty Silt Fence Barriers**
  - Light-Duty Fibre Roll Barriers**
  - Heavy-Duty Sediment Barriers**
  - Heavy-Duty Silt Fence Barriers**
  - Heavy-Duty Wire-Backed Silt Fence Barriers**
  - Berm Barriers**
  - Sandbag Barriers**
  - Fibre Roll Grade Breaks**

Measurement shall be the length in lineal metres from end to end of the barrier constructed, maintained, and removed, following the contours of the ground.

- 805.09.01.02**
  - Flow Check Dams**
  - Straw Bale Flow Check Dams**
  - Fibre Roll Flow Check Dams**
  - Sandbag Flow Check Dams**
  - Rock Flow Check Dams**

For measurement purposes, a count shall be made of the flow check dams constructed, maintained, and removed.

- 805.09.01.03**
  - Sediment Traps**
  - Slope Drains**
  - Diversion Ditches**
  - Sediment Traps for Dewatering**
  - Filter Bags**

For measurement purposes, a count shall be made of the number of sediment traps, slope drains, diversion ditches, sediment traps for dewatering and filter bags constructed or installed, maintained, and removed. Component parts shall not be counted separately for payment.

- 805.09.01.04**
  - Turbidity Curtains**

Measurement of turbidity curtain shall be made in lineal metres along its length from end to end between tie-downs for each turbidity curtain installed, maintained, and removed.

- 805.09.01.05**
  - Cofferdams**

For measurement purposes, a count shall be made of the number of cofferdams constructed, maintained, and removed.

- 805.09.01.06**
  - Sediment Removal**

Measurement shall be as specified in the Contract Documents by the volume of sediment excavated in cubic meters or by the number of hours required for excavation of sediment.

- 805.09.02**
  - Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**805.10 BASIS OF PAYMENT**

- 805.10.01**
- Light-Duty Sediment Barriers - Item**
  - Light-Duty Straw Bale Barriers - Item**
  - Light-Duty Silt Fence Barriers – Item**
  - Light-Duty Fibre Roll Barriers - Item**
  - Heavy-Duty Sediment Barriers - Item**
  - Heavy-Duty Silt Fence Barriers – Item**
  - Heavy-Duty Wire-Backed Silt Fence Barriers – Item**
  - Berm Barriers - Item**
  - Sandbag Barriers - Item**
  - Fibre Roll Grade Breaks – Item**
  - Flow Check Dams - Item**
  - Straw Bale Flow Check Dams - Item**
  - Fibre Roll Flow Check Dams - Item**
  - Sandbag Flow Check Dams - Item**
  - Rock Flow Check Dams – Item**
  - Sediment Traps - Item**
  - Slope Drains – Item**
  - Diversion Ditches - Item**
  - Sediment Traps for Dewatering – Item**
  - Filter Bags - Item**
  - Turbidity Curtains - Item**
  - Cofferdams - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material required to do the work.

Progress payments for the temporary erosion and sediment control measures shall be made as follows:

- a) 30% for initial construction.
- b) 50% for maintenance.
- c) 20% for removal.

**805.10.02 Sediment Removal - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract Documents do not have a separate item for sediment removal, payment at the Contract price for the appropriate tender item for the installation of the sediment control measures shall be full compensation for all labour, Material, and Equipment to do the work of sediment removal.

## **Appendix 805-A, November 2021 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Installation and removal times for temporary erosion and sediment control measures. (805.07.01.06)
- Grading requirements for control measure removal. (805.07.16)
- Sediment removal measurement for payment. (805.09.01.06)

The designer should determine the need for barrier installation. The desirable slope grade is maximum 5%. (805.07.02 and 805.07.03)

The designer should determine the following and, if they are required, the requirements should be included in the Contract Documents:

- Sensitive environmental features. (805.07.01.03)
- The need for a specific light-duty sediment barrier. Where the light-duty sediment barrier is to be built using fibre rolls, the diameter of the fibre rolls to be used and whether and how they may be stacked vertically. (805.07.02)
- The type of seed mix to be applied to the upslope and downslope sides of fibre roll grade breaks. (805.07.02.03)
- The need for a specific heavy-duty sediment barrier. Where the heavy-duty sediment barrier is to be built using fibre rolls, the diameter of the fibre rolls to be used and whether and how they may be stacked vertically. (805.07.03)
- The need for wire backing for a heavy-duty silt fence barrier. (805.07.03.02)
- The need for fibre roll grade breaks and the number, diameter and spacing of fibre rolls required. (805.07.04)
- The need for a specific flow check dam, the number of flow check dams in series required and the spacing of the flow check dams. (805.07.05)
- The need for a sediment trap(s). When a sediment trap is to be constructed in a ditch the outside edge shall be sized to extend beyond the base of the ditch. (805.07.06)
- The need for a slope drain(s). (805.07.07)

Identify the need for a diversion ditch(s). Design dimensions and direction of flow along contour of ground. Outlet details including scour protection and sediment control. The need for, type and number of flow check dam(s), and type of erosion control lining. (805.07.08)

- The need for a sediment trap(s) for dewatering. Ensure that sediment traps for dewatering are sized appropriately for the catchment area and that there is enough space available to construct them. (805.07.09)
- The need for filter bags, and the type, Class and filtration opening size (FOS) of geotextile to be used. (805.07.10)
- Appropriate volume of water to be filtered. (805.07.10)
- The need for a turbidity curtain(s). (805.07.11)
- The need for and design of a cofferdam(s). (805.07.12)
- Whether sediment removal is to be measured by volume or time. (805.09.01.06)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

### **Related Ontario Provincial Standard Drawings**

OPSD 219.100	Light-Duty Straw Bale Barrier
OPSD 219.110	Light-Duty Silt Fence Barrier
OPSD 219.120	Light-Duty Fibre Roll Barrier
OPSD 219.130	Heavy-Duty Silt Fence Barrier
OPSD 219.131	Heavy-Duty Wire-Backed Silt Fence Barrier
OPSD 219.150	Sandbag Barrier
OPSD 219.160	Fibre Roll Grade Breaks
OPSD 219.180	Straw Bale Flow Check Dam
OPSD 219.191	Fibre Roll Flow Check Dam
OPSD 219.200	Sandbag Flow Check Dam
OPSD 219.210	Temporary Rock Flow Check Dam V-Ditch
OPSD 219.211	Temporary Rock Flow Check Dam Flat Bottom Ditch
OPSD 219.220	Sediment Trap In Ditch
OPSD 219.230	Temporary Slope Drain For Sediment Trap
OPSD 219.231	Temporary Berm Barrier
OPSD 219.240	Sediment Trap for Dewatering
OPSD 219.260	Turbidity Curtain
OPSD 219.261	Turbidity Curtain Seam Detail



**MATERIAL SPECIFICATION FOR  
AGGREGATES - MISCELLANEOUS**

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**1004.01 SCOPE**

This specification covers material requirements for aggregates for use as clear stone, granular sheeting, mortar sand, gabion stone, rip-rap, rock protection, truck arrester bed aggregate, and winter sand.

**1004.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **1004.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1004.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Material**

OPSS 1001     Aggregates - General  
OPSS 1010     Aggregates - Base, Subbase, Select Subgrade, and Backfill Material

### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:

LS-601     Materials Finer than 75  $\mu\text{m}$  Sieve in Mineral Aggregates by Washing  
LS-602     Sieve Analysis of Aggregates  
LS-604     Relative Density and Absorption of Coarse Aggregate  
LS-607     Percent Crushed Particles in Processed Coarse Aggregate  
LS-608     Percent Flat and Elongated Particles in Coarse Aggregate  
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LS-616     Petrographic Analysis of Fine Aggregate  
LS-618     Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus  
LS-619     Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus  
LS-625     Guidelines for Sampling of Aggregate Materials  
LS-703/704   Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## ASTM International

C87/C87M-17	Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
D6473-15	Standard Test Method for Specific Gravity and Absorption of Rock for Erosion Control

### 1004.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**CCIL** means the Canadian Council of Independent Laboratories.

**Clear Stone** means a graded aggregate intended for use in drainage, backfill, bedding, and other applications.

**Control Chart** means a graphical method used to monitor the central tendency and the variability of material characteristic in order to control production.

**Deleterious Material** means materials that include, but not limited to, the following: wood, clay brick, clay tile, plastic, gypsum, gypsum plaster, wallboard, roots, and all other organic material.

**Duplicate Samples** means two samples taken at the same time and location, one to be used for quality assurance testing and the other for referee testing.

**Gabion Stone** means a graded fractured rock aggregate intended for use in gabion baskets, gabion mats andrevet (gabion) mattresses.

**Granular Sheeting** means a graded granular aggregate material intended for use as a protective surface layer on erodible soil slopes.

**Mortar Sand** means a fine aggregate intended for application in hydraulic cement-based mortars.

**Nominal Maximum Size** means the largest sieve in the applicable specification upon which material is permitted to be retained.

**Physical Property** means an inherent attribute or feature of an aggregate material. Tests are carried out to determine an aggregate's resistance to weathering or degradation or both.

**Pit-Run Material** means material excavated directly from an existing bank in a pit and delivered to the job site without further processing, i.e., crushing, screening, washing, and classifying.

**Referee Testing** means testing of a material property or attribute for the purpose of resolving acceptance.

**Rip-Rap** means a well graded, fractured rock or crushed reclaimed concrete intended for use as slope protection in hydraulic channels.

**Rock Protection** means a well graded, fractured rock or crushed reclaimed concrete intended for use as general slope protection.

**Spheroidal Particle** means when the ratio of the greatest dimension in the longitudinal axis compared to the least dimension in a plane perpendicular to the longitudinal axis is less than 2:1.

**Statistical Control** means when all sources of assignable variation have been removed, the variability of the process is confined to probability variation alone,

**Truck Arrester Bed Aggregate** means a single-sized aggregate used in runaway truck lanes to slow and stop the progress of vehicles.

**Winter Sand** means a fine aggregate intended for application to roadways during winter conditions to improve frictional properties of the pavement surface.

## **1004.05 MATERIALS**

### **1004.05.01 General**

Aggregates shall be according to OPSS 1001, unless otherwise specified in this specification.

All aggregate source materials shall be clean, hard, durable particles free of earth, humus, clay or other coatings, clay lumps, shale or shaley partings, and other deleterious materials. Aggregates shall be produced from sands, gravels, cobbles, boulders, or quarried rock. Reclaimed asphalt pavement, reclaimed hydraulic cement concrete, glass, other reclaimed materials, and slag materials shall not be used. When reclaimed materials are permitted by this specification or as specified in the Contract Documents, they shall be homogeneously blended. When reclaimed hydraulic cement concrete is permitted, it shall not contain loose reinforcing material and shall be free of protruding metal.

When a change in the character of the aggregate occurs or when the performance of aggregate that meets the requirements of this specification is found to be unsatisfactory, use of the aggregate shall be discontinued until it can be proven to the satisfaction of the Contract Administrator that the source remains acceptable or can be made acceptable.

Irrespective of compliance or non-compliance with the gradation and physical property requirements of this specification, aggregates may be accepted or rejected on the basis of field performance as determined by the Owner.

### **1004.05.02 Clear Stone**

Clear stone may be 53.0 mm, 19.0 mm Type I, 19.0 mm Type II, 16.0 mm, 13.2 mm, or 9.5 mm and shall meet the physical property requirements shown in Table 1 and the gradation requirements shown in Table 2.

### **1004.05.03 Granular Sheeting**

Granular sheeting shall meet the physical property requirements shown in Table 3 and the gradation requirements shown in Table 4.

### **1004.05.04 Mortar Sand**

Mortar sand shall consist of natural sand, or subject to the approval of the Contract Administrator other inert materials with similar characteristics, or combinations thereof, having hard, strong, durable particles. The sand shall be free from a coating of any deleterious material and free from other deleterious substances.

Mortar sand shall meet the physical property requirements shown in Table 5 and the gradation requirements shown in Table 6.



**1004.05.05 Gabion Stone, Rip-Rap, and Rock Protection**

**1004.05.05.01 General**

Rip-rap, rock protection, and gabion stone shall be produced from crushed or fractured bedrock fragments with 100% fractured faces or crushed from cobbles or boulders greater than 300 mm diameter and shall not deteriorate when exposed to air and water and shall be resistant to deterioration by cycles of wetting, drying, freezing, and thawing.

Reclaimed hydraulic cement concrete may be used in non-watercourse applications.

**1004.05.05.02 Rip-Rap and Gabion Stone**

Rip-rap R-10 and R-50 classifications and gabion stone G-3 and G-10 classifications shall meet the physical property requirements shown in Table 7 and gradation requirements shown in Table 8.

**1004.05.05.03 Rock Protection**

Rock protection shall meet the physical property requirements shown in Table 7 and the gradation requirements shown in Table 8.

**1004.05.06 Truck Arrester Bed Aggregate**

Truck arrester bed aggregate shall be pit-run material meeting the physical property requirements shown in Table 9 and the gradation requirements shown in Table 10. In addition, truck arrester bed aggregate shall meet the following shape requirements:

- a) Rounded particles shall be a minimum of 30% by mass. Rounded particles shall be determined by the procedure given in LS-607, reporting the percentage of rounded particles instead of crushed particles. The test specimen size shall be a minimum of 3,000 g passing the 26.5 mm sieve and retained on the 19 mm sieve.
- b) Spheroidal particles shall be a minimum of 50% by mass. Spheroidal particles shall be determined by the procedure given in LS-608, using a figure-eight calliper in which the ratio of the opening at one end to that at the other end is 2:1 instead of 4:1. The test specimen size shall be a minimum of 3,000 g passing the 26.5 mm sieve and retained on the 19 mm sieve.

**1004.05.07 Winter Sand**

Winter sand shall meet the physical property requirements shown in Table 11 and the gradation requirements shown in Table 12.

**1004.07 PRODUCTION**

**1004.07.01 Aggregate Processing, Handling, and Stockpiling**

Aggregates separated during processing shall be placed in individual stockpiles. Processed aggregates secured from different sources and aggregates from the same source but of different gradations shall be placed in individual stockpiles.

Aggregates that have become mixed with foreign matter of any description or aggregates from different stockpiles that have become mixed with each other shall not be used and shall be immediately removed from the stockpile.

Once a stockpile has been produced, sampled, and tested, no further material may be added to the stockpile. Stockpiles produced, sampled, and tested under the procedure for control chart method may continue to have material added, provided that sampling and testing show that the material in the stockpile is in accordance to this specification and that the process remains in statistical control.

## **1004.08                    QUALITY ASSURANCE**

### **1004.08.01                General**

QA testing may be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of this specification. Individual test results may be forwarded to the Contractor as they become available.

Test data for each aggregate type shall be managed independently. When more than one source is used for supplying material, test data from each source and product shall be managed independently.

The laboratory designated by the Owner shall carry out testing for purposes of ensuring that aggregates used in the Work are according to the physical property and grading requirements of this specification. The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise indicated in this specification. Individual test results shall be forwarded to the Contractor, as they become available.

### **1004.08.02                Laboratory Requirements**

The Contract Administrator shall designate all QA laboratories.

An acceptable laboratory conducting tests for physical properties shall be one that holds a current Type D certificate from CCIL for the applicable test methods and also participates in the annual MTO Proficiency Sample Testing Program for the specific tests, when applicable.

An acceptable laboratory conducting tests for gradation according to LS-602, materials finer than 75 µm by washing of the aggregates according to LS-601, and percent crushed particles according to LS-607 shall be one that holds a current Type C certificate from CCIL.

Testing shall be conducted by qualified laboratory staff that holds a current certificate from CCIL in aggregate testing.

Equivalent alternate laboratory and technician certifications or laboratory proficiency testing programs may be used to demonstrate similar requirements, provided that they are acceptable to the Contract Administrator.

### **1004.08.03                Sampling**

Sampling shall be according to LS-625.

Duplicate samples shall be taken and sealed by the Contractor in the presence of the Contract Administrator at the time and location determined by the Contract Administrator. When material contains blended or reclaimed aggregates or both, QA sampling shall be performed on the final blended product.

The mass of each sample shall meet the requirements of Table 13. When more than 30 kg is required, the total sample shall be recombined by the QA laboratory prior to testing.

In the event that the Contractor is unavailable to take the sample, no further materials shall be placed in the Work until the QA sample has been taken.

The Contractor shall provide new or clean sample bags or containers that are constructed to prevent the loss of any part of the material or contamination or damage to the contents during shipment. Metal or cardboard containers are unacceptable. QA samples shall be identified both on the inside and outside of the sample container.

#### **1004.08.04                    Testing and Retention of Samples**

When the Contract Administrator elects to carry out QA testing, one of the duplicate samples shall be randomly selected for testing by the QA laboratory and the remaining sealed sample shall be retained by the QA laboratory for possible referee testing.

#### **1004.08.05                    Winter Sand**

Following delivery, winter sand shall be subject to a visual inspection of the stockpile to determine the presence of oversize material. Oversize particles may be confirmed with a 9.5 mm sieve.

#### **1004.08.06                    Acceptance**

QA test results shall be used for acceptance purposes, except when referee testing or a visual examination of winter sand has been carried out.

When QA test results show that the material meets the requirements of this specification, the aggregates shall be accepted.

When QA test results show that the material does not meet the requirements of this specification, the Contract Administrator shall notify the Contractor that material represented by the test results shall not be accepted. This notification shall take place in writing within 3 Business Days of receipt of the non-conforming data. The Contractor has the option of either removing the material from the work or invoking referee testing. The Contractor may request a reduced price in lieu of removal for aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

#### **1004.08.07                    Referee Testing**

When QA test results do not meet the requirements of this specification, the Contractor has the option of invoking referee testing of the test result that fails to meet the requirements. The Contractor shall notify the Contract Administrator of the selected option in writing within 2 Business Days following written notification of unacceptable material.

The Contract Administrator shall select a referee testing laboratory acceptable to the Contractor within 3 Business Days following the Contractor's notification to invoke referee testing.

Referee test samples shall be delivered to the referee testing laboratory from the QA laboratory by the Contract Administrator. The sealed sample shall be opened in the presence of the Contractor and the Contract Administrator. If referee materials are not available, the Contractor shall be responsible for obtaining and submitting new samples to the referee laboratory from a location to be decided by the Contract Administrator. The Contract Administrator shall be present to witness the sampling.

Referee testing shall be carried out in the presence of the Contract Administrator. When applicable, the referee testing laboratory shall also test a control aggregate sample for each test method required. The Contractor may observe the testing at no cost to the Owner.

The Contractor and the Owner may send a maximum of two representatives each to observe the referee testing. The Contract Administrator shall notify the Owner and the Contractor a minimum of 3 Business Days in advance of the date of referee testing. Provided that such notice was given, referee testing shall be carried out regardless of the absence of one or more observers.

Observers shall follow the referee laboratory protocols for access to the premises and testing equipment and shall not unnecessarily impede the progress of testing. Observers shall be permitted to validate sample identification and view sample condition. Subject to safety requirements, test method and equipment limitation, they shall also be permitted to observe test procedures, take notes, view equipment readings, and review completed work sheets while in attendance.

Comments on the non-conformity of the test methods shall be made and corrected at the time of testing.

Referee test results shall be binding on both the Owner and the Contractor.

When a referee test result shows that the aggregates do not meet the requirements of this specification, the aggregates represented by the test result, including aggregates in existing stockpiles or in the Work, shall not be accepted. The Contractor shall remove the aggregates from the Work at no cost to the Owner. The Contractor may request a reduced price in lieu of removal of the aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

When a referee test result shows that the aggregates meet the requirements of this specification, the aggregates represented by the sample shall be accepted.

The Owner shall be responsible for the cost of referee testing, provided that the referee test results show that the aggregates meet the applicable specifications. Otherwise, the Contractor shall be responsible for the cost.

**TABLE 1**  
**Physical Property Requirements for Clear Stone**

Laboratory Test	MTO Test Number	Nominal Maximum Size			
		53 mm	19 mm		16 mm, 13.2 mm, and 9.5 mm
			Type I	Type II	
Wash Pass 75 µm Sieve, Guideline B, % maximum	LS-601	2.0	2.0	2.0	2.0
Percent Crushed Particles, % minimum	LS-607	-	50	60	60
Micro-Deval Abrasion, Coarse Aggregate, % maximum loss	LS-618	25	25	25	25

**TABLE 2**  
**Gradation Requirements for Clear Stone**

Sieve Size	Gradation (LS-602), Percent Passing					
	Nominal Maximum Size					
	53 mm	19 mm		16 mm	13.2 mm	9.5 mm
Type I		Type II				
63 mm	100	-	-	-	-	-
53 mm	90 - 100	-	-	-	-	-
26.5 mm	-	100	100	-	-	-
19.0 mm	0 - 15	90 - 100	90 - 100	100	-	-
16.0 mm	-	-	65 - 90	96 - 100	100	-
13.2 mm	-	-	-	67 - 86	96 - 100	100
9.5 mm	-	0 - 55	20 - 55	29 - 52	50 - 73	95 - 100
6.7 mm	-	-	-	-	-	20 - 45
4.75 mm	-	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10
75 µm	0 - 2.0	0 - 2.0	0 - 2.0	0 - 2.0	0 - 2.0	0 - 2.0

**TABLE 3**  
**Physical Property Requirements for Granular Sheeting**

Laboratory Test	MTO Test Number	Granular Sheeting
Petrographic Requirement, Fine Aggregate Part A	LS-616	(Note 1)
Micro-Deval Abrasion, Coarse Aggregate, % maximum loss (Note 2)	LS-618	30
Micro-Deval Abrasion, Fine Aggregate, % maximum loss	LS-619	35
Plasticity Index, maximum	LS-703/704	0
<p>Notes:</p> <ol style="list-style-type: none"> <li>For materials north of the French/Mattawa Rivers only: For materials with &gt; 4.0% passing the 75 µm sieve, passing the 150 µm sieve and retained on the 75 µm sieve shall not exceed 10% of the material on that sieve. Prior data demonstrating compliance with this requirement shall be acceptable provided such testing has been done within the past 5 years and the Contractor can show to the satisfaction of the Owner that field performance has continued to be acceptable.</li> <li>The requirement for the coarse aggregate Micro-Deval abrasion loss test shall be waived if the material has more than 80% passing the 4.75 mm sieve.</li> </ol>		

**TABLE 4**  
**Gradation Requirements for Granular Sheeting**

Sieve Size	Gradation (LS-602), Percent Passing
150 mm	100
26.5 mm	50 - 100
13.2 mm	35 - 100
9.5 mm	-
4.75 mm	20 - 80
1.18 mm	10 - 50
300 µm	5 - 25
150 µm	0 - 15
75 µm	0 - 8.0

**TABLE 5**  
**Physical Property Requirements for Mortar Sand**

Laboratory Test	Test Number	Requirement
Organic Impurities, Organic Plate Number	LS-610	3 (Note 1)
Mortar Strength Test	ASTM C87/C87M	(Note 2)
<p>Notes:</p> <ol style="list-style-type: none"> <li>When the fine aggregate is subjected to this test, it shall not produce a colour darker than the standard solution or Organic Plate Number 3. A fine aggregate failing this test may be approved if it meets the requirements of the mortar strength test according to ASTM C87/C87M.</li> <li>Mortar specimens comprised of fine aggregate for use as mortar sand and hydraulic cement shall develop a compressive strength at the age of 7 Days of not less than 90% of the strength developed by a mortar prepared in the same manner with the same cement and with graded Ottawa sand having a fineness modulus of <math>2.40 \pm 0.10</math>.</li> </ol>		

**TABLE 6**  
**Gradation Requirements for Mortar Sand**

Sieve Size	Gradation (LS-602), Percent Passing
4.75 mm	100.0
2.36 mm	95 - 100
1.18 mm	60 - 100
600 µm	35 - 80
300 µm	15 - 50
150 µm	2 - 15
75 µm	0 - 5.0

**TABLE 7**  
**Physical Property Requirements for Gabion Stone, Rip-Rap and Rock Protection**

Laboratory Test	Test Number	Rip-Rap	Gabion Stone	Rock Protection
Specific Gravity, minimum	ASTM D6473 (Note 1)	2.50	2.50	2.5
Absorption, % maximum		2.0	2.0	2.0
Flat and Elongated Particles, % maximum	LS-608 (Note 2)	15	15	15
Micro-Deval Abrasion, Coarse Aggregate, Grading A % maximum loss	LS-618 (Note 3)	25	25	25

Notes:

1. These requirements shall be based on the average test results for at least five pieces of rock when the source is macroscopically uniform or at least 8 pieces of rock when the source is macroscopically non-uniform. In addition, no individual piece of tested rock shall have a specific gravity less than 2.30 or absorption greater than 3.5%.
2. These requirements shall be based on measurements taken of at least 20 randomly-chosen pieces of rock either in stockpile at the source or after being delivered to the site.
3. Testing using LS-618 may be carried out on another aggregate product that is being simultaneously produced from the same crushing stage as rip-rap, gabion stone, or rock protection, as long as the other aggregate product being produced is sufficient for sampling and testing, according to the requirements of the procedure. As an example, if the Contractor can show that rip-rap and Granular A which meets the requirements of OPSS 1010 are being simultaneously produced from a primary crusher, a sample of the Granular A may be used for acceptance testing, in-lieu of testing a sample of rip-rap.



**TABLE 8**  
**Gradation Requirements for Gabion Stone, Rip-Rap, and Rock Protection**

Mass kg	Approximate Dimension mm (Note 1)	Gradation, percent less than mass specified (Note 2)				
		Gabion Stone		Rip-Rap		Rock Protection
		G-3	G-10	R-10	R-50	
330	500	-	-	-	-	100
75	305	-	-	-	100	Well-graded
50	265	-	-	-	70 - 90	
25	210	-	-	-	40 - 55	
15	180	-	100	100	-	
10	155	-	90 - 100	70 - 90	-	
5	125	100	-	40 - 55	-	
3	105	90 - 100	-	-	-	0-10
2.5	100	-	0 - 5	-	0 - 15	-
0.5	60	0 - 5	-	0 - 15	-	-

**Notes:**

1. Masses are based on approximate size of an equivalent cube with a specific gravity of 2.65 and are provided for estimating purposes only.
2. The gradation shall be determined by individually weighing a minimum of 20 randomly-chosen stone particles from a sample taken from the stockpile representing a lot when comparing the total mass of the stone particles within each fraction with the total mass of all of the stone particles measured in the sample. For pieces of rock with masses that are larger than 25 kg, the approximate dimension of the piece determined using an average of three rectilinear measurements of the piece shall be allowed in lieu of weighing.

**TABLE 9**  
**Physical Property Requirements for Truck Arrester Bed Aggregate**

<b>Laboratory Test</b>	<b>MTO Test Number</b>	<b>Requirement</b>
Wash Pass 75 µm Sieve, Guideline B, % maximum	LS-601	1.0
Absorption, % maximum	LS-604	2.0
Unconfined Freeze-Thaw, % maximum loss	LS-614	6
Micro-Deval Abrasion, Coarse Aggregate, % maximum loss	LS-618	21

**TABLE 10**  
**Gradation Requirements for Truck Arrester Bed Aggregate**

<b>Sieve Size mm</b>	<b>Gradation (LS-602), Percent Passing</b>
37.5	100
26.5	90 - 100
19.0	0 - 10

**TABLE 11**  
**Physical Property Requirements for Winter Sand**

<b>MTO Laboratory Test</b>	<b>MTO Test Number</b>	<b>Requirement</b>
Micro-Deval Abrasion, Fine Aggregate, % maximum loss	LS-619	25 (Note 1)

**Notes:**

1. When obtained from sources on St. Joseph Island, Manitoulin Island, or areas of Ontario south and west of a boundary delineated by the Severn River, Provincial Highway 12, and Provincial Highway 7 east of Highway 12.

**TABLE 12**  
**Gradation Requirements for Winter Sand**

<b>Sieve Size</b>	<b>Gradation (LS-602), Percent Passing</b>
9.5 mm	100.0 (Note 1)
6.7 mm	97 - 100
4.75 mm	90 - 100
2.36 mm	50 - 95
1.18 mm	20 - 90
600 µm	0 - 70
300 µm	0 - 35
150 µm	0 - 15
75 µm	0 - 5.0

**Notes:**

1. In addition to LS-602, to be confirmed by visual inspection of the stockpile.
  
- A. The minimum size of the test sample shall be 5 kg. Following oven drying, the sample shall be sieved on the 9.5 mm, 6.7 mm, and 4.75 mm sieves. Material passing the 4.75 mm sieve shall be split to an appropriate size according to LS-602 for subsequent washing and fine sieving. The final grading shall be calculated according to LS-602 as the percentage of material passing each sieve based on the total mass of the oven dried sample.

**TABLE 13**  
**Sample Size Requirements**

<b>Aggregate Type</b>	<b>Nominal Maximum Size mm</b>	<b>Minimum Sample Size kg</b>
Clear Stone	53	80
	19.0	20
	16.0	15
	13.2	15
	9.5	10
Granular Sheeting		25
Mortar Sand		10
Rip-rap / Gabion Stone / Rock Protection (for physical properties only)		25 (consisting of stone particles from 2 to 5 kg each)
Truck Arrestor Bed Aggregate		75
Winter Sand		10

**Appendix 1004-A, November 2021  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Requirements for meeting QA. (1004.03)
- Reclaimed materials. (1004.05.01)
- Warranty provisions. (1004.08.06)
- Warranty provisions in referee testing. (1004.08.07)

The designer should be aware that OPSS 1004 includes the introduction of physical test methods:

The designer may consider the use of reclaimed materials as an alternate aggregate source material. If so, the designer should specify this requirement in the Contract Documents. (1004.05.01)

The designer should be aware that quality assurance (QA) testing for purposes of ensuring material used in the Work meets the requirements of OPSS 1004 is not mandatory, unless specifically included in the Contract Documents. The designer should determine the need for QA testing based on the size and complexity of the work and specify the required frequency of QA sampling and testing (1006.08.01). Appendix 1004-B provides recommended QA sampling and testing frequencies. The designer should determine if the sampling and testing frequencies provided in Appendix 1004-B are to be used for QA purposes. If so, they need to be invoked by reference in the Contract Documents.

The designer should ensure that the need for stability of 53 mm clear stone is considered. When required, the minimum percent crushed requirement should be added. (Table 1)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.

**Appendix 1004-B, November 2021  
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Quality Assurance Sampling and Testing Frequencies**

OPSS.MUNI 1004, Aggregates - Miscellaneous, is amended as follows:

**1004.08 Quality Assurance**

**1004.08.01 General**

The first paragraph of subsection 1004.08.01 is deleted in its entirety and replaced with the following:

QA sampling and testing shall be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of the Contract Documents. QA sampling and testing shall be carried out at the frequency specified in Table B-1. Individual test results may be forwarded to the Contractor as they become available.

Table B-1 is added.

**TABLE B-1  
Sampling and Testing Frequencies for Physical Property and Gradation Requirements**

<b>Aggregate Type</b>	<b>Tender Quantity</b>	<b>Minimum Frequency</b>
Clear stone	< 200 tonnes	At the Contract Administrator's discretion.
	≥ 200 tonnes and < 1,000 tonnes	One sample.
	≥ 1,000 tonnes (Note 1)	One sample per 1,000 tonnes.
Gabion Stone, (m <sup>3</sup> of gabion baskets)	< 100 m <sup>3</sup>	At the Contract Administrator's discretion.
	≥ 100 m <sup>3</sup> and < 1,000 m <sup>3</sup>	One sample.
	≥ 1,000 m <sup>3</sup> (Note 1)	One sample per 1,000 m <sup>3</sup> .
Granular Sheeting	< 200 m <sup>2</sup>	At the Contract Administrator's discretion.
	≥ 200 m <sup>2</sup> and < 5,000 m <sup>2</sup>	One sample.
Rip-Rap	≥ 5,000 m <sup>2</sup> (Note 1)	One sample per 5,000 m <sup>2</sup> .
Rock Protection	< 200 m <sup>3</sup>	At the Contract Administrator's discretion.
	≥ 200 m <sup>3</sup> and < 5,000 m <sup>3</sup>	One sample.
	≥ 5,000 m <sup>3</sup> (Note 1)	One sample per 5,000 m <sup>3</sup> .
Truck Arrestor Bed	< 5,000 tonnes	One sample.
	≥ 5,000 tonnes (Note 1)	One sample per 5,000 tonnes.
Winter Sand	< 500 tonnes	At the Contract Administrator's discretion.
	≥ 500 tonnes and ≤ 5,000 tonnes	One sample.
	> 5,000 tonnes (Note 1)	One sample per 5,000 tonnes.

Notes:

1. When the tender quantity of material is:

- a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.
- b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.



**MATERIAL SPECIFICATION FOR  
AGGREGATES - BASE, SUBBASE,  
SELECT SUBGRADE, AND BACKFILL MATERIAL**

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This specification covers the material requirements for aggregates for use in base, subbase, select subgrade, granular surface, shouldering, and backfill material.



### **1010.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

### **1010.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

### **1010.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

#### **Ontario Provincial Standard Specification, Material**

OPSS 1001     Aggregates - General

#### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:

LS-601	Material Finer than 75 µm Sieve in Mineral Aggregates by Washing
LS-602	Sieve Analysis of Aggregates
LS-607	Percent Crushed Particles in Processed Coarse Aggregate
LS-614	Freezing and Thawing of Coarse Aggregate
LS-616	Petrographic Analysis of Fine Aggregate
LS-617	Percent Particles with Two or More Crushed Faces and Uncrushed Particles in Processed Coarse Aggregate
LS-618	Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-619	Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-621	Determination of Amount of Asphalt-Coated Particles in Coarse Aggregate

LS-625	Guidelines for Sampling of Aggregate Materials
LS-630	Amount of Contamination of Coarse Aggregates
LS-702	Particle Size Analysis of Soils
LS-703/704	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
LS-709	Permeability of Granular Soils

### 1010.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Air-Cooled Blast-Furnace Slag** means the material resulting from solidification of molten blast-furnace slag under atmospheric conditions. Subsequent cooling may be accelerated by application of water to the solidified surface.

**CCIL** means the Canadian Council of Independent Laboratories.

**Ceramic** means porcelain, china, and whiteware (e.g., sinks, toilets, and bidets made from clay and silica fired at a high temperature, excluding clay brick and tile) that is free of organic materials, metal, and plastic.

**Deleterious Material** means materials from the recycling stream other than glass, ceramic, reclaimed asphalt pavement, and reclaimed concrete material that includes but is not limited to the following: wood, clay brick, clay tile, plastic, gypsum, gypsum plaster, and wallboard.

**Duplicate Samples** means two samples taken at the same time and location-one to be used for quality assurance testing and the other for referee testing.

**Fines** means material passing the 75 µm sieve when tested according to LS-601 or LS-602.

**Free of Clay** means the amount of material with a particle diameter less than 2 µm shall not be greater than 1% of the total sample when tested according to LS-702.

**Glass** means processed glass obtained from the recycling stream that is free of organic materials, metal, and plastic.

**Granular A** means a set of requirements for dense graded aggregates intended for use as granular base within the pavement structure, granular shouldering, and backfill.

**Granular B** means a set of requirements for well-graded aggregates intended for use as granular subbase within the pavement structure and granular backfill. Granular B may be Type I, Type II, or Type III.

**Granular M** means a set of requirements for dense graded aggregates intended for use on unpaved road surfaces and for the maintenance of unpaved shoulders.

**Granular O** means a set of requirements for open graded aggregates intended only for use as a free draining granular base within the pavement structure.

**Granular S** means a set of requirements for dense graded aggregates intended only for use as surface dressing of low volume unpaved roads with an AADT less than 200.

**Nickel Slag** means the non-metallic product resulting from the production of nickel.

**Physical Property** means an inherent attribute or feature of an aggregate or soil material. Tests are carried out to determine a materials resistance to weathering or degradation or both.

**Quality Assurance (QA)** means a system or series of activities carried out by the Owner to ensure that Materials received from the Contractor meet the requirements specified in the Contract Documents.

**Reclaimed Asphalt Pavement (RAP)** means processed hot mix asphalt material that is recovered by partial or full depth removal.

**Reclaimed Concrete Material (RCM)** means removed or processed old hydraulic cement concrete.

**Referee Testing** means testing of a material property or attribute for the purpose of resolving acceptance.

**Select Subgrade Material (SSM)** means a set of requirements for well-graded non-plastic aggregates used to replace poor subgrade materials and as swamp backfill.

**Steel Slag** means the non-metallic product resulting from the production of steel in a basic oxygen furnace or electric arc furnace.

## **1010.05 MATERIALS**

### **1010.05.01 General**

Aggregates shall be according to OPSS 1001, unless otherwise specified in this specification.

Aggregates shall meet the physical property requirements shown in Table 1 and the gradation requirements shown in Table 2.

When aggregates are tested according to LS-630, the total amount of wood shall not exceed 0.1% by mass, and the total amount of deleterious material and other contaminants shall not exceed a combined total of 1.0% by mass.

Glass and ceramic material shall be processed to remove all deleterious organic materials. 100% of the processed glass and ceramic material shall pass the 13.2 mm sieve.

When RCM is permitted, RCM shall not contain loose reinforcing materials.

When air-cooled blast furnace slag, nickel slag, and RAP containing steel slag aggregates are used, site-specific notification shall be given by the Contractor to the Ontario Ministry of the Environment (MOE).

When reclaimed materials are permitted, they shall be homogeneously blended.

Steel slag shall not be used.

When a change in the character of the aggregate occurs or when the performance of the aggregate is found to be unsatisfactory, use of those aggregates shall be discontinued until the Contractor can prove to the satisfaction of the Contract Administrator that the source remains acceptable or can be made acceptable.

### **1010.05.02 Granular A, Granular M, and Granular S**

Granular A, Granular M, and Granular S shall be produced by crushing one or more of the following:

- a) Quarried bedrock.
- b) Boulders, cobbles, gravel, sand, and fines from naturally formed deposits.

- c) RAP up to 30% by mass.
- d) RCM up to 100% by mass.
- e) Air-cooled blast-furnace slag or nickel slag.
- f) Glass or ceramic materials up to a combined total of 15% by mass.

Granular A and Granular M containing RAP with steel slag aggregates shall be acceptable for unpaved gravel shoulders only.

### **1010.05.03                    Granular B**

Granular B may be Type I, Type II, or Type III.

#### **1010.05.03.01                Granular B Type I and Type III**

Granular B Type I and Type III may be produced from naturally formed deposits of sand, gravel, and cobbles or by crushing one or more of the following:

- a) Quarried bedrock.
- b) Air-cooled blast-furnace slag or nickel slag.
- c) RCM up to 100% by mass.
- d) RAP up to 30% by mass.
- e) Glass or ceramic materials up to 15% by mass combined.

RAP containing steel slag aggregates shall not be allowed.

#### **1010.05.03.02                Granular B Type II**

Granular B Type II shall only be produced by crushing:

- a) Quarried bedrock.
- b) Air-cooled blast furnace slag or nickel slag.

Steel slag and reclaimed materials shall not be used in the production of Granular B Type II.

#### **1010.05.04                    Granular O**

Granular O shall only be produced by crushing:

- a) Quarried bedrock.
- b) Cobbles or boulders retained on the 50 mm sieve.

Steel slag and reclaimed materials shall not be used in the production of Granular O.

**1010.05.05                    Select Subgrade Material**

Select subgrade material shall only be produced from natural deposits of non-plastic silt, sand, and gravel material. Reclaimed materials of any type shall not be used.

**1010.07                        PRODUCTION**

**1010.07.01                    Aggregate Processing, Handling, and Stockpiling**

Aggregates that have become mixed with foreign matter of any description or aggregates that have become mixed with each other shall not be used and shall be immediately removed from the stockpile.

**1010.08                        QUALITY ASSURANCE**

**1010.08.01                    General**

QA testing may be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of this specification. Individual test results shall be forwarded to the Contractor, as they become available.

Test data for each aggregate type shall be managed independently. When more than one source is used for supplying materials, test data from each source and product shall be managed independently.

The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise specified in the Contract Documents.

**1010.08.02                    Laboratory Requirements**

The Contract Administrator shall designate the QA laboratories.

An acceptable laboratory conducting tests for physical properties shall be one that holds a current Type D certificate from CCIL for the applicable test methods and also participates in the annual MTO Proficiency Sample Testing Program for the specific tests, except LS-616 and LS-709.

An acceptable laboratory conducting tests for gradation according to LS-602 and percent crushed particles according to LS-607 shall be one that holds a current Type C certificate from CCIL.

Testing shall be conducted by qualified laboratory staff that holds a current certificate from CCIL in aggregate testing.

Equivalent alternate laboratory and technician certifications or laboratory proficiency testing programs may be used to demonstrate similar requirements, provided that they are acceptable to the Contract Administrator.

**1010.08.03                    Sampling**

Sampling shall be according to LS-625.

Duplicate samples shall be taken and sealed by the Contractor in the presence of the Contract Administrator at the time and location determined by the Contract Administrator. When materials contain blended or reclaimed aggregates or both, QA sampling shall be performed on the final blended product.

The mass of each sample shall meet the requirements shown in Table 3. When more than 30 kg is required, the total samples shall be recombined by the QA laboratory prior to testing.

In the event that the Contractor is unavailable to take the sample, no further materials shall be placed in the work until the duplicate samples been taken.

The Contractor shall provide new or clean sample bags or containers that are constructed to prevent the loss of any part of the material or contamination or damage to the contents during shipment. Metal or cardboard containers are unacceptable.

QA samples shall be identified on both the inside and the outside of the sample container.

#### **1010.08.04 Testing and Retention of Samples**

When the Contract Administrator elects to carry out QA testing, one of the duplicate samples shall be randomly selected for testing by the QA laboratory and the remaining sealed sample shall be retained by the QA laboratory for possible referee testing.

#### **1010.08.05 Acceptance**

QA test results shall be used for acceptance purposes, except when referee testing has been carried out.

When QA test results show that the aggregates meet the requirements of this specification, the aggregates shall be accepted.

When QA test results show that the aggregates do not meet the requirements of this specification, the Contract Administrator shall notify the Contractor that aggregates represented by the test results shall not be accepted. This notification shall take place in writing within 3 Business Days of receipt of the non-conforming data. The Contractor has the option of either removing the aggregates from the work or invoking referee testing. The Contractor may request a reduced price in lieu of removal of aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

At the discretion of the Contract Administrator, irrespective of non-compliance with the requirements of this specification, aggregates may be accepted on the basis of satisfactory field performance.

#### **1010.08.06 Referee Testing**

When QA test results do not meet the requirements of this specification, the Contractor has the option of invoking referee testing of the test result that fails to meet the requirements. The Contractor shall notify the Contract Administrator of the selected option in writing within 2 Business Days following written notification of unacceptable material.

The Contract Administrator shall select a referee laboratory acceptable to the Contractor within 3 Business Days following the Contractor's notification to invoke referee testing. Referee test samples shall be delivered to the referee testing laboratory from the QA laboratory by the Contract Administrator. The sealed sample shall be opened in the presence of the Contractor and the Contract Administrator. If referee materials are not available, the Contractor shall be responsible for obtaining and submitting new samples to the referee laboratory from a location to be decided by the Contract Administrator. The Contract Administrator shall be present to witness the sampling.

Referee testing shall be carried out in the presence of the Contract Administrator. When applicable, the referee laboratory shall also test a control aggregate sample for each test method required. The Contractor may observe the testing at no cost to the Owner.

The Contractor and Owner may send a maximum of two representatives each to observe the referee testing. The Contract Administrator shall notify the Owner and Contractor a minimum of 3 Business Days in advance of the date of referee testing. Provided that such notice was given, referee testing shall be carried out regardless of the absence of one or more observers.

Observers shall follow the referee laboratory protocols for access to the premises and testing equipment and shall not unnecessarily impede the progress of the testing. Observers shall be permitted to validate sample identification and view sample condition. Subject to safety requirements, test method and equipment limitations, they shall also be permitted to observe test procedures, take notes, view equipment readings and review completed work sheets while in attendance.

Comments on the non-conformity of the test methods shall be made and corrected at the time of testing.

Referee test results shall be binding on both the Owner and the Contractor.

When a referee test result shows that the aggregates do not meet the requirements of this specification, the aggregates represented by the test result, including aggregates in existing stockpiles or in the Work, shall not be accepted. The Contractor shall remove the aggregates from the Work at no cost to the Owner. The Contractor may request a reduced price in lieu of the removal of aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

When a referee test result shows that the aggregates meet the requirements of this specification, the aggregates represented by the sample shall be accepted.

The Owner shall be responsible for the cost of referee testing provided that the referee test results show that the aggregates meet the applicable specifications. Otherwise, the Contractor shall be responsible for the cost.

**TABLE 1  
Physical Property Requirements**

<b>MTO Laboratory Test and Number</b>	<b>Granular O</b>	<b>Granular A</b>	<b>Granular S</b>	<b>Granular B Type I and Type III</b>	<b>Granular B Type II</b>	<b>Granular M</b>	<b>Select Subgrade Material</b>
Percent crushed particles, % minimum, LS-607	100	60	50	--	--	60	--
Unconfined Freeze-Thaw, % maximum loss, LS-614	15	--	--	--	--	--	--
2 or more crushed faces, % minimum, LS-617	85 (Note 1)	--	--	--	--	--	--
Micro-Deval Abrasion Coarse Aggregate, % maximum loss, LS-618	21	25	25	30 (Note 2)	30	25	30 (Note 2)
Micro-Deval Abrasion, Fine Aggregate, % maximum loss, LS-619	25	30	30	35	35	30	N/A
Asphalt Coated Particles, % maximum, LS-621	0	30	30	30	0	30	0
Amount of Contamination, LS-630	(Note 3)						
Plasticity Index, maximum LS-703/704	0						
Determination of Permeability, k, LS-709	(Note 4)						

**Notes:**

1. When Granular O is produced from boulders, cobbles, or gravel retained on the 50 mm sieve.
2. The coarse aggregate Micro-Deval abrasion loss test requirements shall be waived if the material has more than 80% passing the 4.75 mm sieve.
3. Granular A, B Type I, B Type III, or M may contain crushed glass or ceramic materials up to a combined total of 15% by mass. Granular A, B Type I, B Type III, M, O, and S shall not contain more than 1% by mass of wood, clay brick and/or gypsum and/or gypsum wall board or plaster. Granular B Type II and SSM shall not contain more than 0.1% by mass of wood.
4. For materials north of the French and Mattawa Rivers only, the coefficient of permeability, k, shall be greater than  $1.0 \times 10^{-4}$  cm/s or alternatively, where past field experience has demonstrated satisfactory performance. Prior data demonstrating compliance with this requirement for k shall be acceptable, provided such testing has been done within the 5 years of the material being used and field performance has continually been shown to be satisfactory.



**TABLE 2**  
**Gradation Requirements - Percent Passing**

MTO Test	Sieve	Granular							Select Subgrade Material
		A	B (Note 1)			M	O	S	
			Type I (Note 2)	Type II	Type III (Note 2)				
Sieve Analysis, % Passing, LS-602	150 mm	N/A	100	N/A	100	N/A	N/A	N/A	100
	106 mm	N/A	N/A	100	N/A	N/A	N/A	N/A	N/A
	37.5 mm	N/A	N/A	N/A	N/A	N/A	100	N/A	N/A
	26.5 mm	100	50-100	50-100	50-100	N/A	95-100	100	50-100
	19.0 mm	85-100 (87-100, Note 3)	N/A	N/A	N/A	100	80-95	90-100	N/A
	13.2 mm	65-90 (75-95, Note 3)	N/A	N/A	N/A	75-95	60-80	75-100	N/A
	9.5 mm	50-73 (60-83, Note 3)	N/A	N/A	32-100	55-80	50-70	60-85	N/A
	4.75 mm	35-55 (40-60, Note 3)	20-100	20-55	20-90	35-55	20-45	40-60	20-100
	1.18 mm	15-40	10-100	10-40	10-60	15-40	0-15	20-40	10-100
	300 µm	5-22	2-65	5-22	2-35	5-22	N/A	11-25	5-95
	150 µm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.0-65.0
	75 µm	2.0-8.0 (2.0-10.0, Note 4)	0-8.0 (0-10.0, Note 4)	0-10.0	0-8.0 (0-10.0, Note 4)	2.0-8.0 (2.0-10.0, Note 4)	0-5.0	9.0-15.0 (9.0-17.0, Note 4)	0-25.0

**Notes:**

1. When Granular B is used for granular backfill for pipe subdrains, 100% of the material shall pass the 37.5 mm sieve.
2. When RAP is blended with Granular B Type I or Type III, 100% of the RAP shall pass the 75 mm sieve. Conditions in Note 1 supersede this requirement.
3. When the aggregate is obtained from an air-cooled blast furnace slag source.
4. When the aggregate is obtained from a quarry or an air-cooled blast furnace slag or nickel slag source.

**TABLE 3**  
**Sample Size**

<b>Material</b>	<b>Minimum Mass of Individual Field Samples kg</b>
Granular A, S, M, and O	25
Granular B and SSM	50
Granular B and SSM (100% passing 26.5 mm sieve)	25
<b>Note:</b> A. Each sample container shall hold no more than 30 kg of aggregate. When more than 30 kg is required, additional sample containers shall be used.	

**Appendix 1010-A, November 2013  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Type of Granular B to be used. (1010.05.03)

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- If the quality assurance sampling and testing frequencies provided in Appendix 1010-B are to be used, Appendix 1010-B needs to be invoked by reference in the Contract Documents.
- If the payment reduction in lieu of aggregate removal provided in Appendix 1010-C is to be used, Appendix 1010-C needs to be invoked by reference in the Contract Documents.
- If the test data forms in Appendices 1010-D and 1010-E are to be used for submission purposes, Appendices 1010-D and 1010-E need to be invoked by reference in the Contract Documents.

The use of steel slag aggregate is prohibited.

The designer should be aware that aggregates that are wholly or partially comprised of industrial by-products and/or recycled materials such as, but not limited to, air-cooled iron blast furnace slag, nickel slag, and RAP containing steel slag aggregates, may have specific placement and approval requirements or constraints to mitigate adverse affects on the environment based on local conditions and/or municipal and MOE policy. Prior to tendering, when such Owner supplied or specified materials are to be used, the designer should provide site notification to MOE and ensure any applicable environmental placement and approval requirements and constraints are included in the Contract Documents.

RAP content is determined by LS-621, percent Asphalt Coated Particles. However, this test is limited to identifying RAP content in the coarse aggregate portion only. When RAP in fine aggregate is a concern a Petrographic Examination of the material passing the 4.75 mm sieve is recommended. (1010.05.02)

The designer should be aware that quality assurance (QA) testing for the purpose of ensuring material used in the work meet the requirements of OPSS 1010 is not mandatory unless specifically included in the Contract Documents. The designer should determine the need for QA testing based on the size and complexity of the work and specify the required frequencies of QA sampling and testing. Appendix 1010-B provides recommended QA sampling and testing frequencies.

The designer may specify a higher percent crushed requirement to improve performance in higher traffic areas.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Appendix 1010-A**

**Related Ontario Provincial Standard Drawings**

No information provided here.

**Appendix 1010-B, November 2013  
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Quality Assurance Sampling and Testing Frequency**

OPSS.MUNI 1010, Aggregates-Base, Subbase, Select Subgrade, and Backfill Material, is amended as follows:

**1010.08 QUALITY ASSURANCE**

**1010.08.01 General**

The first paragraph of subsection 1010.08.01 is deleted in its entirety and replaced with the following:

QA sampling and testing shall be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of the Contract Documents. QA sampling and testing shall be carried out at the frequency specified in Table B-1. Individual test results may be forwarded to the Contractor as they become available.

Table B-1 is added.

**TABLE B-1  
Sampling and Testing Frequency for Physical Property Requirements**

<b>Quantity from Each Source or Process</b>	<b>Granular A; Granular B - Type I, II, and III; Granular M; Granular O; and Select Subgrade Material</b>
≤ 5,000	One sample.
> 5,000 (Note 1)	One sample per 5,000 tonnes.
<p><b>Note:</b></p> <p>1. When the quantity of material is:</p> <ul style="list-style-type: none"> <li>a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.</li> <li>b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.</li> </ul>	

**Appendix 1010-B**

Table B-2 is added.

**TABLE B-2**  
**Sampling and Testing Frequency for Gradation Requirements**

<b>Quantity from Each Source or Process t</b>	<b>Granular A, O, and M</b>	<b>Granular B - Type I, II, and III, and Select Subgrade Material</b>
< 250	At the Contract Administrator's discretion.	
≥ 250 and ≤ 1,000	One sample.	
> 1,000 (Note 1)	One sample per 1,000 tonnes.	
<p>Note:</p> <p>1. When the quantity of granular material is:</p> <ul style="list-style-type: none"><li>a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.</li><li>b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.</li></ul>		

**Appendix 1010-C, November 2013**

**FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Reduced Price Payment In Lieu of Aggregate Removal**

When a tested sample of aggregates shows that the aggregates do not meet the requirements of this specification, the aggregates represented by the test result, including material in existing stockpiles or in the Work, shall not be accepted. The Contractor may request a reduced price in lieu of removal provided the applicable test results:

- a) Do not exceed the requirement for LS-614 by more than 25% of the specified value.
- b) Do not exceed the requirement for LS-618 by more than 10% of the specified value.
- c) Do not identify a plasticity index within the material when determined according to LS-703/704 and the requirement for LS-602 on the 75  $\mu\text{m}$  is met.
- d) Meet all other requirements of this specification.

Irrespective of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

**Appendix 1010-D, November 2013**

**FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**OPSS 1010 - Aggregate Test Data - Granulars  
Physical Properties**

Contract No.:		Contractor:		Contract Location:	
Name of Testing Laboratory:			Telephone No.:		Fax No.:
Sampled by (Print Name):			Date Sampled (YY/MM/DD):		Date Tested (YY/MM/DD):
Granular Type:			Quantity (tonnes) :		
Source Name/Location:			Aggregate Inventory Number (AIN) :		

Laboratory Test and Number	Requirements								Test Results		
	A	B Type I	B Type II	B Type III	M	O	S	SSM	Reference Material	Sample	Meets Requirements (Y/N)
Crushed Particles, % minimum, LS-607	60	--	100	--	60	100	50	--			
Unconfined Freeze-Thaw, % maximum loss, LS-614	--	--	--	--	--	15	--	--			
2 or more Crushed Faces, % minimum, LS-617	--	--	--	--	--	85 (Note 1)	--	--			
Micro-Deval Abrasion, Coarse Aggregate % maximum loss, LS-618	25	30 (Note 2)	30	30 (Note 2)	25	21	25	30 (Note 2)			
Micro-Deval Abrasion, Fine Aggregate % maximum loss, LS-619	30	35	35	35	30	25	30	--			
Asphalt Coated Particles, % maximum, LS-621	30	30	0	30	30	0	30	0			
Amount of Contamination, LS-630	(Note 3)										
Plasticity Index, maximum, LS-703/704	0										
Determination of Permeability, <i>k</i> , LS-709	(Note 4)										

Notes:  
 1. When Granular O is produced from boulders, cobbles, or gravel retained on the 50 mm sieve.  
 2. The coarse aggregate Micro-Deval abrasion loss test requirement shall be waived if the material has more than 80% passing the 4.75 mm sieve.  
 3. Granular A, B Type I, B Type III, or M may contain up to 15 percent by mass crushed glass or ceramic materials. Granular A, B Type III, M, O, and S shall not contain more than 1.0 percent by mass of wood, clay brick and/or gypsum and/or gypsum wall board or plaster. Granular B Type II and SSM shall not contain more than 0.1 percent by mass of wood.  
 4. For materials north of the French/Mattawa Rivers only, the coefficient of permeability, *k*, shall be greater than  $1.0 \times 10^{-4}$  cm/s or field experience has demonstrated satisfactory performance. Prior data demonstrating compliance with this requirement for *k*, shall be acceptable provided that such testing has been done within 5 years of the material being used and field performance has continually been shown to be satisfactory.

I hereby certify that testing has been carried out by a properly qualified/certified test technician:

Issued by: \_\_\_\_\_  
 PRINT NAME TESTING LABORATORY REPRESENTATIVE SIGNATURE DATE

Received by: \_\_\_\_\_  
 PRINT NAME CONTRACT ADMINISTRATOR REPRESENTATIVE SIGNATURE DATE

Copies to: Contract Administrator Contractor







## **MATERIAL SPECIFICATION FOR CHAIN-LINK FENCE COMPONENTS**

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#### **1541.01 SCOPE**

This specification covers the requirements for chain-link fence components and hardware.

##### **1541.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **1541.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1541.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 772 Chain-Link Fence

### **Canadian General Standards Board (CGSB)**

138.1-96 Fabric for Chain Link Fence  
138.2-96 Steel Framework for Chain Link Fence  
138.4-96 Gates for Chain Link Fence

### **ASTM International**

A 27/A 27M-17 Steel Casting, Carbon, for General Application  
A 153/A 153M-16 Zinc Coating (Hot-Dip) on Iron and Steel Hardware  
A 824-01 (2017) Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence  
F 626-14 Fence Fittings

## **1541.03 DEFINITIONS**

For the purpose of this specification, the definitions in OPSS 772 apply.

**1541.05 MATERIALS**

**1541.05.01 Fence Fabric**

The fence fabric shall be 1,200 or 1,800 mm wide according to the Contract Documents, with a uniform 50 mm diamond pattern chain-link mesh closed at one edge by knuckling and at the other edge by twisting.

The steel wire for chain-link fence fabric shall be according to CAN/CGSB 138.1. The fence fabric shall be one of the types listed in Table 1.

The vinyl coating for wire fabric shall be black in colour.

**1541.05.02 Posts and Rails**

All posts, post sleeves, and rails shall be galvanized steel pipe and shall be according to CAN/CGSB 138.2.

When vinyl-coated fence fabric is used, all posts, post sleeves, and rails shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1.

**1541.05.03 Diagonal Wire Braces, Top and Bottom Wires for use with Galvanized Steel Fence Fabric**

Top wire, bottom wire, and diagonal wire braces shall be 4.50 mm diameter marcelled tension wire Type II according to ASTM A 824 with a minimum Class 5 galvanized coating.

**1541.05.04 Diagonal Wire Braces, Top and Bottom Wires for use with Vinyl-Coated Fence Fabric**

Top wire, bottom wire, and diagonal wire braces shall be 4.50 mm diameter marcelled tension wire Type II according to ASTM A 824 with a minimum Class 3 galvanized coating. The wire shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1

**1541.05.05 Gates**

Gates shall be constructed from galvanized steel pipe frames and braces according to CAN/CGSB 138.4. All joints shall be electrically welded and coated with a zinc rich paint after welding.

When vinyl-coated fence fabric is used, gate frames and braces shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1.

**1541.05.06 Fittings**

Tension bars, tension bands, brace bands, top rail sleeves, and rail ends shall be according to ASTM F 626.

Barbed wire arms shall be fabricated from galvanized pressed steel or cast iron according to CAN/CGSB 138.2 or ASTM F 626.

Terminal and line post caps shall be according to ASTM F 626.

When vinyl-coated fence fabric is used, the fittings shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1

**1541.05.07 Hardware**

All required hardware including, but not limited to carriage bolts and nuts, shall be hot dip galvanized according to ASTM A 153.

**1541.05.08 Fasteners**

Wire ties for attaching fence fabric to line posts, bottom wires, top rails, and top wires shall be according to ASTM F 626.

**1541.05.08.01 Fasteners for Galvanized Steel Fence Fabric**

Wire ties for attaching fence fabric to line posts and top rails shall be manually fastened round wire ties, 3.76 mm diameter steel wire, with a minimum 488 g/m<sup>2</sup> galvanized coating or power fastened round wire ties, 3.76 mm diameter steel wire, with a minimum of 488 g/m<sup>2</sup> galvanized coating.

Wire ties for attaching fence fabric to bottom or top wires shall be round wire hog rings, 2.69 mm diameter steel wire, with a minimum 488 g/m<sup>2</sup> galvanized coating.

**1541.05.08.02 Fasteners for Vinyl Coated Fence Fabric**

Wire ties for attaching fence fabric to line posts and top rails shall be manually fastened round wire ties, 3.76 mm diameter zinc or aluminum coated steel core wire, with a vinyl coating or power fastened round wire ties, 3.76 mm diameter zinc or aluminum coated steel core wire, with a vinyl coating.

Wire ties for attaching fence fabric to bottom or top wires shall be round wire hog rings, 2.69 mm diameter zinc or aluminum coated steel core wire, with a vinyl coating.

Fasteners shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1.

**1541.05.09 Turnbuckles**

Turnbuckles shall be drop forged steel according to ASTM A 27 and shall be galvanized according to ASTM A 153.

The average overall length shall be approximately 300 mm with ends in the closed position. Bolt diameter shall be approximately 10 mm and capable of taking up a minimum of 150 mm slack.

**1541.05.10 Barbed Wires**

Barbed wires shall be according to CAN/CGSB 138.2.

**1541.07 PRODUCTION**

**1541.07.01 Gates**

All gates shall be supplied with galvanized malleable iron or pressed steel hinges, latch, and latch catch and shall be capable of opening approximately 180 degrees. Gate latches shall be suitable for use with padlocks that can be attached and operated from either side of the gate.

Gates shall be supplied completely assembled, including the fabric. The gate fabric and wire ties used on the gate shall match the adjacent fence fabric and be subjected to the same quality requirements.

**1541.09                      OWNER PURCHASE OF MATERIAL**

**1541.09.01                      Measurement and Payment**

Measurement of fence fabric shall be by length in metres.

Measurement of barbed wire shall be by length in metres.

For measurement purposes, a count shall be made of the number of posts and rails delivered and accepted.

Diagonal wire brace and top and bottom wires shall be measured in the units specified in the purchasing order.

For measurement purposes, a count shall be made of the gates delivered and accepted, regardless of the size and type of gate. Double gates shall be counted as one gate.

For measurement purposes, a count shall be made of the fittings and hardware of each type specified in the purchasing order delivered and accepted.

For measurement purposes, a count shall be made of the number of turnbuckles delivered and accepted.

Payment at the price specified in the purchasing order shall be for the supply of fence fabric, posts and rails, diagonal wire braces, top and bottom wires, gates, fittings and accessories, turnbuckles, and barbed wires delivered to the destination on the date and time specified.

The cost of all testing, except that performed in the Owner's laboratory, shall be included in the price.

**TABLE 1  
Fence Fabric**

<b>Type</b>	<b>Nominal Diameter of Zinc-Coated Wire mm</b>	<b>Minimum Weight of Galvanized Coating g/m<sup>2</sup></b>	<b>Nominal Diameter of Vinyl-Coated Wire mm</b>	<b>Minimum Wire Breaking Strength N</b>	<b>Standard</b>
Class B - Zinc-Coated Galvanized Before Weaving (WGW) Steel Fabric	3.5	488	n/a	5000	CAN/CGSB 138.1
Class D - Vinyl-Coated Steel Fabric	3.5	90	4.26	5000	CAN/CGSB 138.1

**Appendix 1541-A, April 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 972.101	Fence, Chain-Link, Component - Barbed Wire
OPSD 972.102	Fence, Chain-Link, Component - Gate
OPSD 972.130	Fence, Chain-Link, Installation - Roadway
OPSD 972.131	Fence, Chain-Link, Installation - Concrete Barrier
OPSD 972.132	Fence, Chain-Link, Details and Table





**MATERIAL SPECIFICATION FOR  
CORRUGATED STEEL PIPE (CSP) PRODUCTS**

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**APPENDICES**

<b>1801-A</b>	<b>Commentary</b>
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**1801.01 SCOPE**

This specification covers the requirements for all corrugated steel pipe products to be used for storm sewers, pipe culverts, and subdrains.

**1801.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be as specified in the Contract Documents.

## **1801.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1801.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Corrugated Steel Pipe Institute**

- Bulletin 18 Certification Program for Corrugated Steel Pipe Institute Members & Products CSA G401 Protocol
- Bulletin 19 Certification Program for Structural Plate Corrugated Steel Pipe Products and Deep Corrugated Structural Plate Products

### **CSA Standards**

- G401-14 Corrugated Steel Pipe Products

## **1801.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Certification Body** means an independent 3<sup>rd</sup> party agency accredited by the Standards Council of Canada that has the qualifications, skills, and expertise required to confirm that a pipe manufacturer produces pipe products to the quality and requirements of an accepted standard and that has the mandate to certify the pipe products produced.

**Certified** means pipe products that have been marked with a certification body's logo confirming that the production of the pipe product is in accordance with the quality and requirements of CSA G401.

**Corrugated Steel Pipe Products** means any one or any combination of the following products:

- round corrugated steel pipe with an end finish
- corrugated steel pipe arch with an end finish
- round structural plate corrugated steel pipe with an end finish
- structural plate corrugated steel pipe arch with an end finish
- round spiral rib pipe with an end finish
- spiral rib steel pipe arch with an end finish
- perforated corrugated steel pipe
- corrugated steel pipe coupler bands with or without gasket
- corrugated steel pipe end sections
- corrugated steel pipe safety slope end treatments
- corrugated steel pipe saddle branches

**Delivered Quality** means the pipe products' physical condition upon arrival at the construction site in terms of the extent and degree of dents, scratches, cracks, pipe coating integrity, etc., that appear on the pipe products delivered.

**1801.05 MATERIALS**

**1801.05.01 Corrugated Steel Pipe Products**

Corrugated steel pipe products shall be according to CSA G401 and Appendix A of the same standard. CSP coating shall be galvanized, aluminized Type 2, or polymer laminated and structural plate culvert coating shall be galvanized or thermoplastic co-polymer as specified in the Contract Documents.

**1801.07 PRODUCTION**

**1801.07.01 Fabrication**

The pipe diameter, wall thickness, coating, and type of all corrugated steel pipe products shall be as specified in the Contract Documents.

All corrugated steel pipe products used on the Contract shall be supplied from a manufacturer that is certified to produce corrugated steel pipe products in accordance with CSA G401. Refer to the Corrugated Steel Pipe Institute's technical bulletins 18 for CSP and 19 for SPCS plant CSA certification programs.

When the delivered quality of certified corrugated steel pipe products is deemed to be unacceptable by the Contract Administrator, the products shall be rejected.

**1801.08 QUALITY ASSURANCE**

**1801.08.01 Inspection, Testing, and Record Keeping**

Inspection, testing, and record keeping for corrugated steel pipe products shall be according to CSA G401.

**1801.08.02 Markings**

Certified corrugated steel round pipe and pipe arch and certified spiral rib round pipe and pipe arch shall be marked according to CSA G401, along with the logo of the certification body and name of the pipe manufacturer.

Certified structural plate corrugated steel pipe plate shall be marked according to CSA G401, along with the logo of the certification body and name of the pipe manufacturer.

Accepted certification body logos confirming certified corrugated steel pipe products shall be as shown in Figures 1 and 2.

### **1801.08.03                      Certificate of Compliance**

When requested by the Owner, the Contractor shall provide a certificate of compliance for subdrains and the corrugated steel pipe products used for eccentric loader assemblies to indicate that the product was produced and tested according to the appropriate specification requirements.

When requested by the Owner, the Contractor shall provide a copy of the certificate of compliance from the manufacturer for storm sewers and pipe culverts. The manufacturer's certificate of compliance shall be issued by the certification body confirming that the manufacturer produces certified corrugated steel pipe products in accordance with CSA G401.

### **1801.09                              OWNER PURCHASE OF MATERIAL**

Measurement of corrugated steel pipe with corrugated steel coupler bands shall be by length in metres along the centreline of the pipe.

For measurement purposes, a count shall be made of all other corrugated steel pipe products.

Payment at the price specified in the purchasing order shall be for the supply of corrugated steel pipe with coupler bands and other corrugated steel pipe products delivered to the destination on the date and time specified.

The cost of all testing, except that performed in the Owner's laboratory, shall be included in the price.



**FIGURE 1**  
**CSA Standards Certification Logo**



**FIGURE 2**  
**Canadian Welding Bureau Certification Logo**

**Appendix 1801-A, November 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Coating type. (1801.05.01)
- Pipe diameter, wall thickness, coating, and type. (1801.07.01)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 800.010	Concrete Pipe Culvert and Sewer Extensions Using Corrugated Steel Pipe
OPSD 800.011	Concrete Rigid Frame Box and Open Culvert Extensions Using Corrugated Steel Pipe
OPSD 801.010	Cut End Finish, Circular Pipe and Pipe-Arch Corrugated Steel Pipe
OPSD 801.020	End Section Details, Corrugated Steel Pipe
OPSD 801.030	Bevel Details, Circular and Pipe-Arch Structural Plate, Corrugated Steel Pipe
OPSD 801.040	Culvert and Sewer Safety Slope End Treatment, Notes and Tables
OPSD 801.041	Culvert and Sewer Safety Slope End Treatment, Assembly Details
OPSD 801.042	Culvert and Sewer Safety Slope End Treatment, Connection Details
OPSD 801.043	Culvert and Sewer Safety Slope End Treatment, Installation Details
OPSD 805.010	Height of Fill Table, Round Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe
OPSD 805.020	Height of Fill Table, Corrugated Steel Pipe-Arch and Structural Plate Corrugated Steel Pipe-Arch
OPSD 805.030	Height of Fill Table, Spiral Rib Round Pipe
OPSD 805.040	Height of Fill Table, Spiral Rib Pipe-Arch



## **MATERIAL SPECIFICATION FOR GEOTEXTILES**

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<b>1860-A</b>	<b>Commentary</b>

### **1860.01 SCOPE**

This specification covers the material requirements for geotextiles.

#### **1860.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

#### **1860.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1860.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **ASTM International**

D 4354-12	Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing
D 4355/D 4355M-14	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
D 4491/D 4491M-17	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D 4533/D 4533M-15	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
D 4873-16	Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
D 4632/D 4632M-15a	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
D 6241-14	Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50 mm Probe

### **Canadian General Standards Board (CGSB)**

148.1 No. 10-94	Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size
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### **Bureau de Normalisation du Québec (BNQ)**

BNQ 7009-910	Geotextiles - Quality of Geotextiles Used in Road Engineering - Certification Protocol
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## 1860.03

### DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Duplicate Samples** means two samples taken at the same time and location, one to be used for quality assurance testing and the other for referee testing.

**Filtration Opening Size (FOS)** means the opening size of a geotextile in microns corresponding to 95% by mass particle diameter passing through the geotextile in the hydrodynamic sieving test CAN/CGSB 148.1, Method No. 10.

**Geosynthetic** means a synthetic material used in geotechnical engineering applications. Geosynthetics may include such items as geotextiles, geomembranes, geocells, geogrids, geonets, and geocomposites.

**Geotextile** means a permeable synthetic textile material that is used in association with foundation, soil, rock, earth, or other geotechnical related material for one or more of the following functions: separation, filtration, drainage, or protection. They may be woven, non-woven, or knitted.

**Lat** means a length equal to the circumference of a full geotextile roll provided by the manufacturer.

**Minimum Average Roll Value (MARV)** means the average value minus two standard deviations of a given property established by the manufacturer during production. The average roll value for a given property must meet or exceed this value.

**Quality Assurance (QA)** means a system or series of activities carried out by the Owner to ensure that materials received from the Contractor meet the specified requirements.

**Quality Control (QC)** means a system or series of activities carried out by the Contractor, Subcontractor, supplier, and manufacturer to ensure that materials supplied to the Owner meet the specified requirements.

**Referee Testing** means testing of a material attribute for the purpose of resolving acceptance issues at the request of the Contractor or the Owner.

## 1860.04

### DESIGN AND SUBMISSION REQUIREMENTS

#### 1860.04.01

#### Submission Requirements

Prior to the use of a geotextile in the Work, a certificate from the manufacturer stating the name of the manufacturer, product name, style number, chemical composition, and other pertinent information required to fully describe the geotextile as evaluated under the manufacturer's QC program, shall be submitted to the Contract Administrator. The certificate shall identify the name of the supplier of the geotextile covered pipe or tubing. A person having legal authority to bind the manufacturer or supplier shall attest to this certificate.

Upon request, documentation describing the manufacturer's QC program shall be made available to the Contract Administrator.

The requirements stated above shall be waived for geotextiles certified according to BNQ 7009-910.

## 1860.05

### MATERIALS

Geotextile fibre or yarn shall be composed of at least 95% by mass of polypropylene, polyethylene, polyester, or other synthetic polymers, excluding polyamides.

Geotextiles shall contain stabilizers or inhibitors, if necessary, to make the filaments resistant to deterioration by excessive ultraviolet (UV) light and heat exposure. Geotextiles shall be resistant to acid and alkali action and shall be unaffected by micro-organisms and insects.

## **1860.07                    PRODUCTION**

### **1860.07.01                Woven Geotextiles**

Woven geotextiles shall be produced by interlacing two or more sets of filaments, yarns, fibres, film, tape, or other elements in such a way that the elements pass each other, essentially at right angles and with one set of elements parallel to the fabric axis. The edge of woven geotextiles shall be finished to prevent the outer yarn from pulling away.

### **1860.07.02                Non-Woven Geotextiles**

Non-woven geotextiles shall consist of a manufactured sheet, web, or batt of directionally or randomly-oriented fibres, filaments, or other elements produced by bonding or interlocking the elements by mechanical, thermal, or chemical means.

### **1860.07.03                Knitted Sock Geotextiles**

Knitted sock geotextiles shall be produced by interlooping one or more yarns, fibres, or filaments in a continuous tube. Knitted sock geotextiles are suitable only for wrapping of subdrain pipe.

### **1860.07.04                Seams**

When sections of geotextile are joined by sewing, the seam strength shall be at least 90% of the minimum tensile strength requirement for the class of geotextile specified in the Contract Documents.

Seams joining two sections of geotextile shall be sewn with thread meeting the material requirements for the geotextile or, shall be bonded by thermal or chemical means.

### **1860.07.05                Physical Requirements**

#### **1860.07.05.01            Woven and Non-Woven Geotextiles**

Woven and non-woven geotextiles are classified as either Class I or Class II and shall meet the physical property requirements shown in Table 1.

#### **1860.07.05.02            Knitted Sock Geotextiles**

Knitted sock geotextiles shall meet the physical property requirements shown in Table 2.

#### **1860.07.05.03            Temporary Silt Fence**

Geotextiles for temporary silt fence shall be woven or non-woven and shall meet the physical property requirements shown in Table 3.

### **1860.07.06                Protection during Shipment and Storage**

Geotextiles shall be protected against excessive UV exposure and contamination from dirt, dust, moisture, and any other deleterious materials, until they are installed. All geotextiles shall be wrapped in an opaque protective covering from the time of manufacture to the time of installation. The geotextiles and protective wrapping shall be free of tears and punctures, upon delivery to the work.

Geotextiles intended to be covered by soil, rock, earth, or other materials shall not be exposed to direct sunlight for more than 72 hours following the removal of the protective wrap.

Geotextiles shall be protected from temperatures greater than 60 °C.

#### **1860.07.07 Identification**

Each roll of geotextile or geotextile-covered pipe or tubing shall be clearly marked according to ASTM D 4873 with a permanent, legible identification tag or label either on the protective wrap or the inner core as applicable, or affixed to a geotextile-covered pipe or tubing. Product labels shall show the name of the manufacturer or supplier, product number, type, Class, roll number, and date of manufacture.

For Class I and Class II geotextiles, the product label requirements stated in the paragraph above, shall be waived for geotextiles certified by the BNQ according to BNQ 7009-910 for the requirements specified in the Materials and Production sections. BNQ-certified geotextiles shall bear the "BNQ" mark of conformity, the BNQ Product Designation, as specified in Table 1, as well as all other identification marks specified by BNQ.

### **1860.08 QUALITY ASSURANCE**

#### **1860.08.01 General**

When the Owner has elected to carry out QA testing to ensure that material used in the Work is according to the requirements of this specification, applicable geotextiles shall be sampled and tested according to the methods identified in Tables 1, 2, or 3, at the following rates:

- a) For Class I or II geotextile, one sample per 10,000 m<sup>2</sup> of installed product.
- b) For knitted sock geotextile, one sample per 10,000 m of installed subdrain pipe wrapped with knitted sock geotextile.
- c) For temporary silt fence geotextile, one sample per 10,000 m of silt fence barrier installed.

When the quantity of a geotextile is less than the lot size specified above, a minimum of one QA sample per each geotextile type shall be tested to verify that the material meets the requirements of this specification.

As specified elsewhere in the Contract Documents, the Contract Administrator shall be allowed access to all sampling locations and reserves the right to request a QA sample at any time without notice to the Contractor.

Testing shall be carried out at a laboratory designated by the Owner. The Owner shall be responsible for all costs associated with QA testing.

#### **1860.08.02 Sampling**

##### **1860.08.02.01 General**

QA sampling shall be carried out by the Contractor, in the presence of the Contract Administrator.

Sampling shall be according to ASTM D 4354 and as specified in the Contract Documents.

All QA samples shall be duplicate samples with both samples taken side-by-side.

Each sample shall be rolled and placed into separate UV-protective containers (e.g., sealed cardboard box or opaque plastic bag). If a rolled sample is too large to fit within a UV-protective container, it may be folded in a manner that minimizes the number of folds required to fit the sample into the container.

Each sample shall be accompanied with a copy of the roll label or identification tag, as well as the appropriate contract-related information and testing requirements, as specified in the Contract Documents. All such information shall be placed in a moisture-proof envelope directly attached to each UV-protective container.

Where security bags and seals are required, each UV-protective container shall be placed within a separate security bag sealed by the Contract Administrator.

#### **1860.08.02.02            Sample Size, Preparation, and Marking**

Samples of Class I and Class II geotextiles shall be the full width of the roll and at least 2.0 meters in length in the machine direction.

Samples of temporary silt fence geotextile and knitted socks shall be a minimum of 3.0 m<sup>2</sup> in area.

When samples are taken from a roll of material for testing, at least a full lat of the material from that roll shall be discarded prior to sampling.

All samples shall be completely dry, free of damage, dust, or other contamination, at all times. Any samples that have been allowed to become moist or wet shall be air-dried in a protected place, away from direct sunlight until they are completely dry, prior to packaging.

All samples shall be permanently marked with the machine direction.

For temporary silt fence geotextile that is attached to wooden stakes, the wooden stakes shall be carefully removed to avoid any tearing of the geotextile and the stakes discarded. The area within 150 mm of each of the stakes that were removed, shall then be permanently marked by crosshatching, to ensure that such areas are not used for testing.

#### **1860.08.03            Acceptance**

When QA testing has been carried out, QA test results shall be used for acceptance purposes.

#### **1860.08.04            Referee Testing**

When QA test results do not meet the requirements of this specification, the Contractor has the option of invoking referee testing for the test result or results that failed to meet the requirements, as long as a duplicate QA sample is available for testing.

The Contractor shall notify the Contract Administrator, in writing, invoking this option within 5 Business Days following notification of unacceptable material. The notification shall include the type and, where applicable, the class of geotextile, as well as the specific attribute or attributes for which the referee testing is being requested.

Referee testing shall be carried out, as specified herein and elsewhere in the Contract Documents.

The Owner shall select a referee laboratory, within 5 Business Days following the Contractor's notification to invoke referee testing.

The Contractor may observe the testing, at no additional cost to the Owner. The Contract Administrator shall notify the Contractor a minimum of 5 Business Days in advance of the date of referee testing. Provided that such notice was given, referee testing shall be carried out regardless of the absence of observers.

Observers shall follow the referee laboratory protocols for access to the premises and testing equipment and shall not unnecessarily impede the progress of the testing. Observers shall be permitted to validate sample identification and view sample condition. Subject to safety requirements, test method, and equipment limitations, Observers shall be permitted to observe test procedures, take notes, view equipment readings, and review completed work sheets while in attendance.

Concerns with sample condition or sample identification shall be made known prior to commencement of the referee testing. Comments on deviations from the applicable test method shall be made at the time of testing. Unresolved concerns shall be specific in nature and submitted, in writing, to the laboratory's designated representative and other observers, at the time of testing.

Referee test results shall be binding on both the Owner and the Contractor.

When a referee test result shows that the materials are in accordance with the physical property requirements of this specification, then the material represented by that test result shall be accepted.

When a referee test result shows that the material does not meet the physical property requirements of this specification, then the material represented by that test result, including any material already in the Work, shall be considered rejectable.

The Owner shall be responsible for the cost of referee testing, provided that the referee test results show that the geotextile meets the applicable requirements of this specification. Otherwise, the Contractor shall be responsible for the cost of referee testing.

## **1860.09                    OWNER PURCHASE OF MATERIAL**

### **1860.09.01                General**

Geotextiles supplied to the Owner under this specification shall be of the type, Class, and FOS range as specified in the Contract Documents. Material not meeting the requirements of this specification may be rejected by the Owner.

### **1860.09.02                Measurement and Payment**

Payment at the price specified in the Contract Documents, in square metres, shall be for the supply of geotextiles delivered to the destination on the date and time specified.

Rejected material shall be replaced at no additional cost to the Owner.

**TABLE 1**  
**Physical Property Requirements for Woven and Non-Woven Geotextiles**

Property	Test Method	Unit	Geotextile Class			
			Class I		Class II*	
			Woven	Non-Woven	Woven	Non-Woven
			BNQ Product Designation			
			OPSS 1860-I-W	OPSS 1860-I-N	OPSS 1860-II-W	OPSS 1860-II-N
Tensile strength, MARV, minimum	ASTM D 4632/D 4632M	N	800	350	1100	700
Tear strength, MARV, minimum	ASTM D 4533/D 4533M	N	300	180	400	250
Puncture strength, MARV, minimum	ASTM D 6241	N	1650	990	2200	1375
Permittivity, minimum	ASTM D 4491/D 4491M, Method A	s <sup>-1</sup>	0.05			
Filtration opening size (FOS)	CAN/CGSB 148.1, Method No. 10	μ	As specified in the Contract Documents			
Ultraviolet stability, minimum	ASTM D 4355	%	50% retained tensile strength at 500 hours			

*\*Note: A Class II Woven geotextile may be used to replace a Class I Woven geotextile or a Class II Non-Woven geotextile may be used to replace a Class I Non-Woven geotextile, as long as the geotextile being proposed for use meets the requirements for Filtration Opening Size (FOS), according to CAN/CGSB 148.1, Method No. 10, as specified in the Contract Documents.*

**TABLE 2**  
**Physical Property Requirements for Knitted Sock Geotextiles**

Property	Test Method	Acceptance Requirements
Puncture resistance, N	ASTM D 6241	800
FOS, maximum, μm	CAN/CGSB 148.1, Method No. 10	As specified in the Contract Documents
Permittivity, minimum, s <sup>-1</sup>	ASTM D 4491/D 4491M, Method A	2.75

**TABLE 3**  
**Physical Property Requirements for Temporary Silt Fence Geotextiles**

Property	Test Method	Unit	Supported Silt Fence	Unsupported Silt Fence	
				Woven	Non-Woven
Maximum post spacing	-	m	1.2	2.0	1.2
Tensile strength, MARV, minimum	ASTM D 4632/D 4632M	N	400	550	
Permittivity, minimum	ASTM D 4491/D 4491M	s <sup>-1</sup>	0.05		
Filtration Opening Size (FOS), maximum	CAN/CGSB 148.1, Method No. 10	µm	As specified in the Contract Documents		
Ultraviolet stability, minimum	ASTM D 4355/D 4355M	%	70% retained tensile strength at 500 hours		

**Appendix 1860-A, November 2018  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The Owner should specify the following in the Contract Documents:

- Class, type (e.g., woven or non-woven), and FOS range of the geotextile. (1860.09.01)

The designer may consider reducing the sampling frequency for larger quantities of geotextile. (1860.08.01)

The designer should be aware that higher strength materials than those specified in Table 1 are available for specific applications.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 206.050	Subdrain Pipe Connection and Outlet
OPSD 207.030	Concrete and Composite Pavement on Open Graded Drainage Layer
OPSD 207.041	Subdrain Pipe Open Graded Drainage Layer
OPSD 207.044	Subdrain Pipe Connection and Outlet Open Graded Drainage Layer
OPSD 216.021	Subdrain Pipe Connection and Outlet
OPSD 219.110	Light-Duty Silt Fence Barrier
OPSD 219.130	Heavy-Duty Silt Fence Barrier
OPSD 219.131	Heavy-Duty Wire-Backed Silt Fence Barrier
OPSD 219.210	Temporary Rock Flow Check Dam
OPSD 219.211	Temporary Rock Flow Check Dam Flat Bottom Ditch
OPSD 219.231	Temporary Berm Barrier for Slope Drain
OPSD 219.240	Sediment Trap for Dewatering
OPSD 219.260	Turbidity Curtain
OPSD 219.261	Turbidity Curtain Seam Detail
OPSD 802.013	Flexible Pipe Embedment and Backfill Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment Original Ground: Earth or Rock
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment Original Ground: Earth or Rock
OPSD 802.033	Rigid Pipe Bedding, Cover, and Backfill rock Excavation
OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment Original Ground: Earth or Rock
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill Rock Excavation
OPSD 802.054	Horizontal Elliptical Rigid Pipe Bedding and cover in Embankment Original Ground: Earth or Rock
OPSD 810.010	General Rip-Rap Layout for Sewer and Culvert Outlets
OPSD 810.020	General Rip-Rap Layout for Ditch Inlets





# Credit Valley Conservation Seed Mixes

Version 1.1 August 2014

In partnership with Ontario Seed Company (OSC), CVC has developed a variety of seed mixes that are appropriate for use within the Credit River watershed. These seed mixes are suitable for restoration and naturalization projects, as well as for planting plans for stormwater management facilities.

These mixes have been designed to be used in a variety of soil and moisture conditions. Proponents can select any supplier to purchase their seed mixes but CVC recommends suppliers who obtain their seeds locally.

## Application Rate

These seed mixes should be applied at a rate of 22 - 25 kg/ha (21-23 lbs/acre) or at a rate of 250g/90 m<sup>2</sup> (1/2lb/1000 sq. ft) for smaller areas.

### CVC 1 - FACW Wetland Meadow Mixture

Common Name	Scientific Name	% of Mix
Bebb's Sedge	Carex bebbii	1%
Blue Lobelia	Lobelia siphilitica	1%
Blue Vervain	Verbena hastata	10%
Boneset	Eupatorium perfoliatum	1%
Dark Green Bulrush	Scirpus atrovirens	1 %
Fox Sedge	Carex vulpinoidea	27%
New England Aster	Aster novae-angliae	2%
Purple Stemmed Aster	Aster puniceus	1%
Fowl Bluegrass	Poa palustris	20%
Soft Rush	Juncus effusus	2%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Square Stemmed Monkey Flower	Mimulus ringens	2%
Swamp Milkweed	Asclepias incarnata	1%
Tall Mannagrass	Glyceria grandis	2%
Virginia Wild Rye	Elymus virginicus	27%
Woolgrass	Scirpus cyperinus	1%
		100%

### CVC 2 - Naturalized Wetland Mixture

Common Name	Scientific Name	% of Mix
Bebb's Sedge	Carex bebbii	5%
Boneset	Eupatorium perfoliatum	1%
Fowl Bluegrass	Poa palustris	25%
Fox Sedge	Carex vulpinoidea	40%
Dark Green Bulrush	Scirpus atrovirens	5%
Nodding Bur Marigold	Bidens cernua	1%
Purple Stemmed Aster	Aster puniceus	1%
Rice Cutgrass	Leersia oryzoides	7%
Soft Rush	Juncus effusus	10%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Stalk-grain Sedge	Carex stipata	2%
Swamp Milkweed	Asclepias incarnata	1%
Tall Mannagrass	Glyceria grandis	1%
		100%

### CVC 3 - Valley Land Mixture (semi moist)

Common Name	Scientific Name	% of Mix
Fowl Manna Grass	Glyceria striata	2%
Fowl Bluegrass	Poa palustris	30%
Fox Sedge	Carex vulpinoidea	30%
Path Rush	Juncus tenuis	8%
Virginia Wild Rye	Elymus virginicus	30%
		100%

### CVC 4 - Wet Meadow Marsh Mix

Common Name	Scientific Name	% of Mix
Blue Vervain	Verbena hastata	9%
Blue Flag	Iris versicolor	1%
Dark Green Bulrush	Scirpus atrovirens	8%
Purple Stemmed Aster	Aster puniceus	1%
Fox Sedge	Carex vulpinoidea	35%
New England Aster	Aster novae-angliae	1%
Rice Cutgrass	Leersia oryzoides	1%
Soft Rush	Juncus effusus	5%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Square Stemmed Monkey Flower	Mimulus ringens	1%

Swamp Milkweed	<i>Asclepias incarnata</i>	1%
Virginia Wild Rye	<i>Elymus virginicus</i>	35%
Wool Grass	<i>Scirpus cyperinus</i>	1%
		100%

### CVC 5 - Acid Soil Wetland Mix

Common Name	Scientific Name	% of Mix
Bebb's Sedge	<i>Carex bebbii</i>	1%
Creeping Bentgrass	<i>Agrostis stolonifera</i>	12%
Fox Sedge	<i>Carex vulpinoidea</i>	35%
Boneset	<i>Eupatorium perfoliatum</i>	1%
Dark Green Bulrush	<i>Scirpus atrovirens</i>	5%
Nodding Bur Marigold	<i>Bidens cernua</i>	1%
Soft Rush	<i>Juncus effusus</i>	10%
Stalk-grain Sedge	<i>Carex stipata</i>	2%
Virginia Wild Rye	<i>Elymus virginicus</i>	32%
Wool Grass	<i>Scirpus cyperinus</i>	1%
		100%

### CVC 6 - Early Succession Wet Meadow Mix

Common Name	Scientific Name	% of Mix
Bebb's Sedge	<i>Carex bebbii</i>	5%
Purple Stemmed Aster	<i>Aster puniceus</i>	1%
Fowl Bluegrass	<i>Poa palustris</i>	25%
Fox Sedge	<i>Carex vulpinoidea</i>	25%
Great Blue Lobelia	<i>Lobelia siphilitica</i>	1%
New England Aster	<i>Aster novae-angliae</i>	1%
Path Rush	<i>Juncus tenuis</i>	3%
Canada Goldenrod	<i>Solidago canadensis</i>	2%
Soft Rush	<i>Juncus effusus</i>	5%
Stalk-grain Sedge	<i>Carex stipata</i>	4%
Tall Manna Grass	<i>Glyceria grandis</i>	2%
Virginia Wild Rye	<i>Elymus virginicus</i>	25%
Wild Bergamot	<i>Monarda fistulosa</i>	1%
		100%

### CVC 7 - Upland Native Meadow Mix

Common Name	Scientific Name	% of Mix
Black Eyed Susan	Rudbeckia hirta	10%
Blue Wood (Heart Leaved Aster)	Aster cordifolius	1%
Canada Anemone	Anemone canadensis	1%
Canada Goldenrod	Solidago canadensis	2%
Common Milkweed	Asclepias syriaca	2%
Evening Primrose	Oenothera biennis	25%
Grass Leaved Goldenrod	Euthamia graminifolia	1%
Meadow/Open Field Sedge	Carex granularis	15%
New England Aster	Aster novae-angliae	1%
Riverbank Wild Rye	Elymus riparius	40%
Virgins Bower	Clematis virginiana	1%
Wild Bergamot	Monarda fistulosa	1%
		100%

### CVC8 - Wetland Restoration Mix

Common Name	Scientific Name	% Mix
Bebb's Sedge	Carex bebbii	1%
Blue Vervain	Verbena hastata	3%
Boneset	Eupatorium perfoliatum	1%
Canada Anemone	Anemone canadensis	1%
Canada Bluejoint	Calamagrostis canadensis	1%
Canada Goldenrod	Solidago canadensis	1%
Dark Green Bulrush	Scirpus atrovirens	6%
Fowl Bluegrass	Poa palustris	20%
Fowl Mannagrass	Glyceria striata	1%
Fox Sedge	Carex vulpinoidea	20%
Grass Leaved Goldenrod	Euthamia graminifolia	1%
Purple Stemmed Aster	Aster puniceus	1%
Spotted Joe Pye Weed	Eupatorium maculatum	1%
Spreading Bentgrass	Agrostis stolonifera	20%
Stalk-grain Sedge	Carex stipata	1%
Swamp Milkweed	Asclepias incarnata	1%
Virginia Wild Rye	Elymus virginicus	20%
		100%

## Cover Crop

A cover crop should be utilized with each of the seed mixes. The cover crop will act as a nurse crop, provide short term erosion control and weed control.

## Application Rate

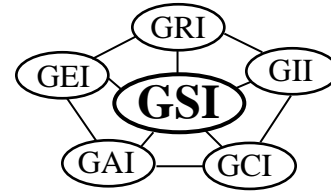
The cover crop should be applied at rate of 22kg/ha (20lbs/acre).

Common Name	Scientific Name
Common Oats	Avena sativa
Buckwheat	Fagopyrum esculentum

Note that CVC does not recommend the use of Annual Ryegrass (*Lolium multiflorum*) due its allelopathic properties as well as its confusion and potential hybridization with Perennial Rye (*Lolium perenne*).

# Geosynthetic Institute

475 Kedron Avenue  
Folsom, PA 19033-1208 USA  
TEL (610) 522-8440  
FAX (610) 522-8441



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Revision Schedule: pg. 7

## GRI -GT12(a)\* - ASTM Version Standard Specification

Standard Specification for

### “Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials”<sup>SM</sup>

This specification was developed by the Geosynthetic Research Institute (GRI) with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

#### 1. Scope

- 1.1 This specification covers nonwoven geotextile test properties for subsequent use as protection (or cushioning) materials.

Note 1: The typical use will be as a protective covering or underlayment of a geomembrane against puncture or tear due to rock, stones, concrete or other hard surfaces and/or objects.

- 1.2 This specification sets forth a set of physical, mechanical and endurance properties that must be met, or exceeded by the geotextile being manufactured.

- 1.3 In the context of quality systems and management, this specification represents a manufacturing quality control (MQC) document.

Note 2: Manufacturing quality control represents those actions taken by a manufacturer to assure that a product represents the stated objective and properties set forth in the specification.

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\*This GRI standard specification is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version and it is kept current on the Institute’s Webpage <<geosynthetic-institute.org>>.

- 1.4 This standard specification is intended to assure good quality and performance of fabrics used as geotextile protection materials but is possibly not adequate for the complete specification in a specific situation. Additional tests, or more restrictive values for the tests indicated, may be necessary under conditions of a particular application.
- 1.5 This standard specification does not address installation practices or design guidance. Both of these items are addressed in the literature dealing with this particular application.

## 2. Referenced Documents

### 2.1 ASTM Standards

- D 4354 Practice for Sampling of Geosynthetics for Testing
- D 4533 Test Method for Trapezoidal Tearing Strength of Geotextiles
- D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
- D 4759 Practice for Determining the Specification Conformance of Geosynthetics
- D 4873 Guide for Identification, Storage and Handling of Geotextiles
- D 5035 Test Method for Breaking Strength and Elongation of Textile Fabrics (2” Strip Method)
- D 5261 Test Method for Measuring Mass per Unit Area of Geotextiles
- D 6241 Test Method for Static Puncture Strength of Geotextiles and Geotextile Related Product Using a 50-mm Probe
- D 7238 Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent Condensation Apparatus

### 2.2 AASHTO Specification

M288-05 Geotextile Specification for Highway Applications

## 3. Definitions

- 3.1 Formulation - The mixture of a unique combination of ingredients identified by type, properties and quantity. For nonwoven geotextiles, a formulation is defined as the exact percentages and types of resin(s), additives and/or carbon black.
- 3.2 Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications [ref. EPA/600/R-93/182].

Note 3: This particular specification for nonwoven protection geotextiles falls under the concept of MQC.

- 3.3 Minimum Average Roll Value (MARV) – For geosynthetics, a manufacturing quality control tool used to allow manufacturers to establish published values such that the user/purchaser will have a 97.7% confidence that the property in question will meet published values. For normally distributed data, “MARV” is calculated as the typical value minus two (2) standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.
4. Material Classification and Formulation
  - 4.1 This specification covers geotextiles used as protection (or cushioning) materials.
  - 4.2 The type of resins are usually polypropylene, polyester or polyethylene, but other resins are also possible in this regard.
  - 4.3 The type of geotextile style is designated as a nonwoven since research has shown these fabrics to be most effective in the typical applications toward which this specification is directed. While needle-punched nonwovens are usually used, heat bonded and resin dipped manufacturing styles (or others) can also be considered.
5. Specification Requirements
  - 5.1 The geotextiles for use as protection (or cushioning) materials shall conform to Table 1. The table is given in English units and in SI (Metric) units. The conversion from English to SI units is “soft”.
  - 5.2 Since there are a number of geotextile puncture test methods available, Table 2 is provided. Either of these tests can be considered to be an alternative test replacing ASTM D4833 in Table 1. The decision to make such a replacement must be agreed upon by the parties involved. The table is given in English units and in SI (Metric) units. The conversion from English to SI units is “soft”.
  - 5.3 The required values for all properties in Tables 1 and 2 are to be minimum average roll values (MARV) except UV resistance which is a minimum value.
6. Workmanship and Appearance
  - 6.1 The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning.
  - 6.2 General manufacturing procedures shall be performed in accordance with the manufacturer’s internal quality control guide and/or documents.



## 7. MQC Sampling, Testing, and Acceptance

7.1 Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling shall be in accordance with the most current modification of ASTM Standard D 4354, using the section titled, "Procedure for Sampling for Purchaser's Specification Conformance Testing." In the absence of purchaser's testing, verification may be based on manufacturer's certifications as a result of testing by the manufacturer of quality assurance samples obtained using the procedure for Sampling for Manufacturer's Quality Assurance (MQA) Testing. A lot size shall be considered to be the shipment quantity of the given product or a truckload of the given product, whichever is smaller.

7.2 Testing shall be performed in accordance with the method referenced in this specification for the indicated application. The number of specimens to test per sample is specified by each test method. Geotextile product acceptance shall be based on ASTM D4759. Product acceptance is determined by comparing the average test results of all specimens within a given sample to the specification MARV. Refer to ASTM D 4759 for more details regarding geotextile acceptance procedures.

## 8. MQC Retest and Rejection

8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality manual.

## 9. Shipment and Storage

9.1 Geotextile labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

9.2 Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

9.3 During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.

10. Certification

- 10.1 The contractor shall provide to the engineer a certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the geotextile.
- 10.2 The manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.
- 10.3 The manufacturer's certificate shall state that the finished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. A person having legal authority to bind the manufacturer shall attest to the certificate.
- 10.4 Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

**USA Units**

Table 1(a) – Required Properties, Test Methods and Values for Geotextiles Used as Geomembrane Protection (or Cushioning) Materials

Property <sup>(1)</sup>	Test Method ASTM	Unit	Mass/Unit Area (oz/yd <sup>2</sup> )					
			10	12	16	24	32	60
Mass per unit area	D5261	oz/yd <sup>2</sup>	10	12	16	24	32	60
Grab tensile strength	D4632	lb	230	300	370	450	500	630
Grab tensile elongation	D4632	%	50	50	50	50	50	50
Trap. tear strength	D4533	lb	95	115	145	200	215	290
Puncture (CBR) strength	D6241	lb	700	800	900	1100	1700	2400
UV resistance <sup>(2)</sup>	D7238	%	70	70	70	70	70	70

Notes:

- (1) All values are MARV except UV resistance; it is a minimum value.
- (2) Evaluation to be on 2.0 inch strip tensile specimens per ASTM D 5035 after 500 lt. hrs. exposure.

**S.I. (Metric) Units**

Table 1(b) – Required Properties, Test Methods and Values for Geotextiles Used as Geomembrane Protection (or Cushioning) Materials

Property <sup>(1)</sup>	Test Method ASTM	Unit	Mass/Unit Area (g/m <sup>2</sup> )					
			340	406	542	812	1080	2000
Mass per unit area	D5261	g/m <sup>2</sup>	340	406	542	812	1080	2000
Grab tensile strength	D4632	kN	1.02	1.33	1.64	2.00	2.25	2.80
Grab tensile elongation	D4632	%	50	50	50	50	50	50
Trap. tear strength	D4533	kN	0.42	0.51	0.64	0.89	0.96	1.27
Puncture (CBR) strength	D6241	kN	3.11	3.56	4.00	4.90	7.56	10.60
UV resistance <sup>(2)</sup>	D7238	%	70	70	70	70	70	70

Notes:

- (1) All values are MARV except UV resistance; it is a minimum value.
- (2) Evaluation to be on 50 mm strip tensile specimens per ASTM D5035 after 500 lt. hrs. exposure.

## **Adoption and Revision Schedule**

**for**

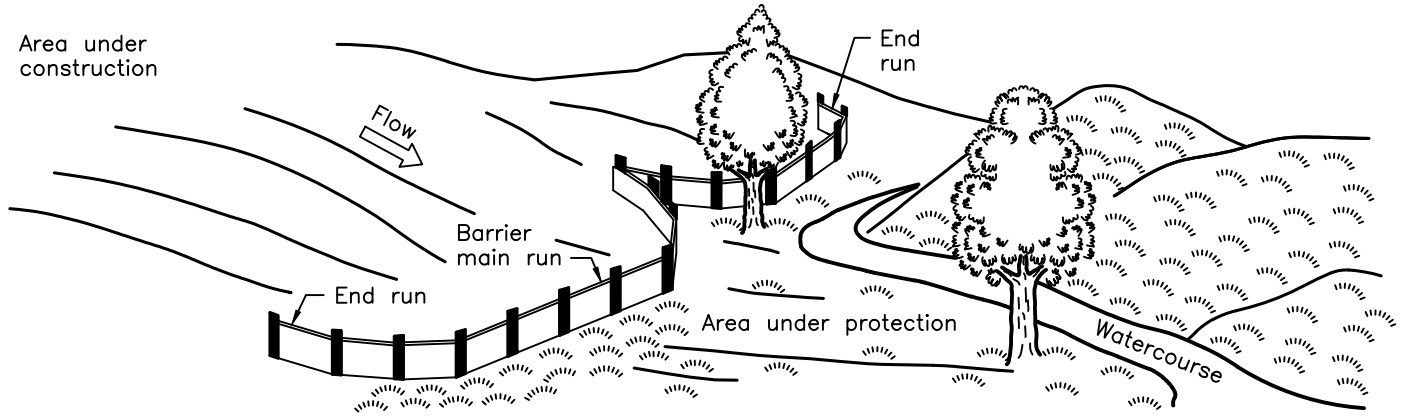
### **“Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials”**

Original: February 18, 2002

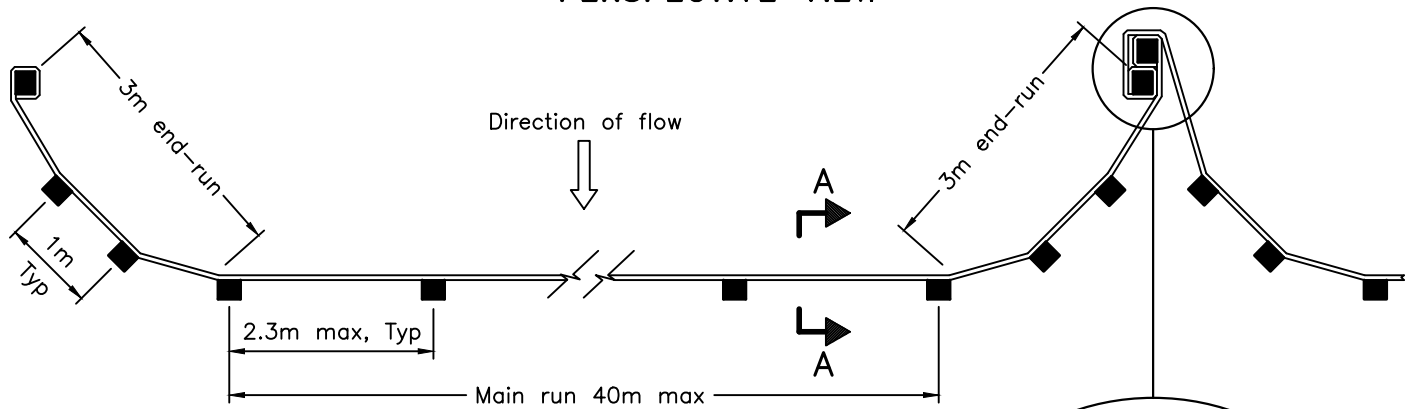
Revision 1: December 18, 2012: Replaced ASTM D4355 with ASTM D7238

Revision 2: March 3, 2016: Deleted ASTM D4833 Pin Puncture and ASTM D5495 Pyramid Puncture from the Standard

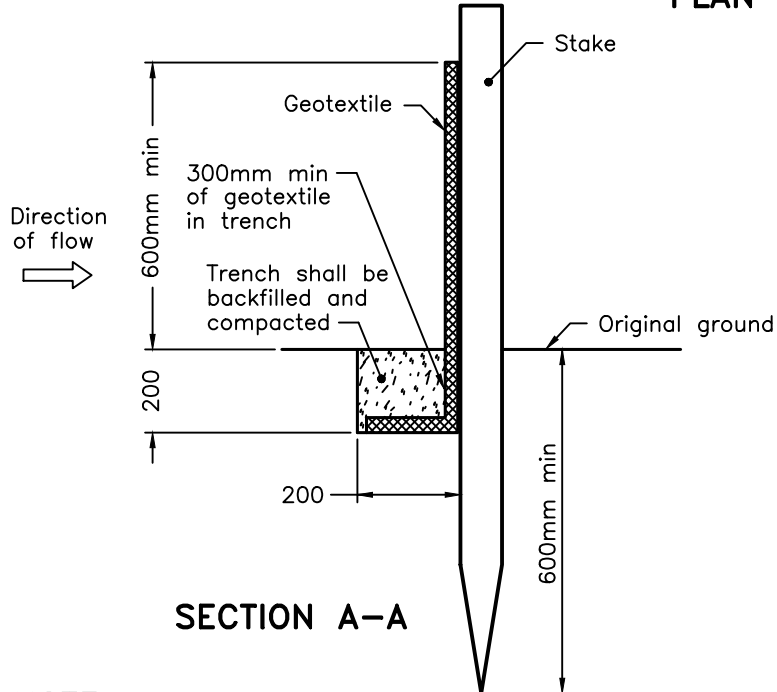
Area under construction



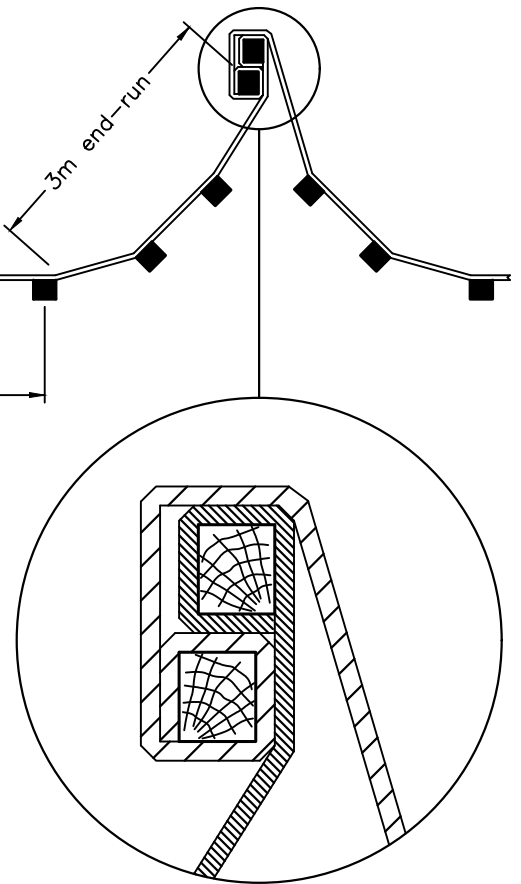
PERSPECTIVE VIEW



PLAN



SECTION A-A



JOINT DETAIL

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

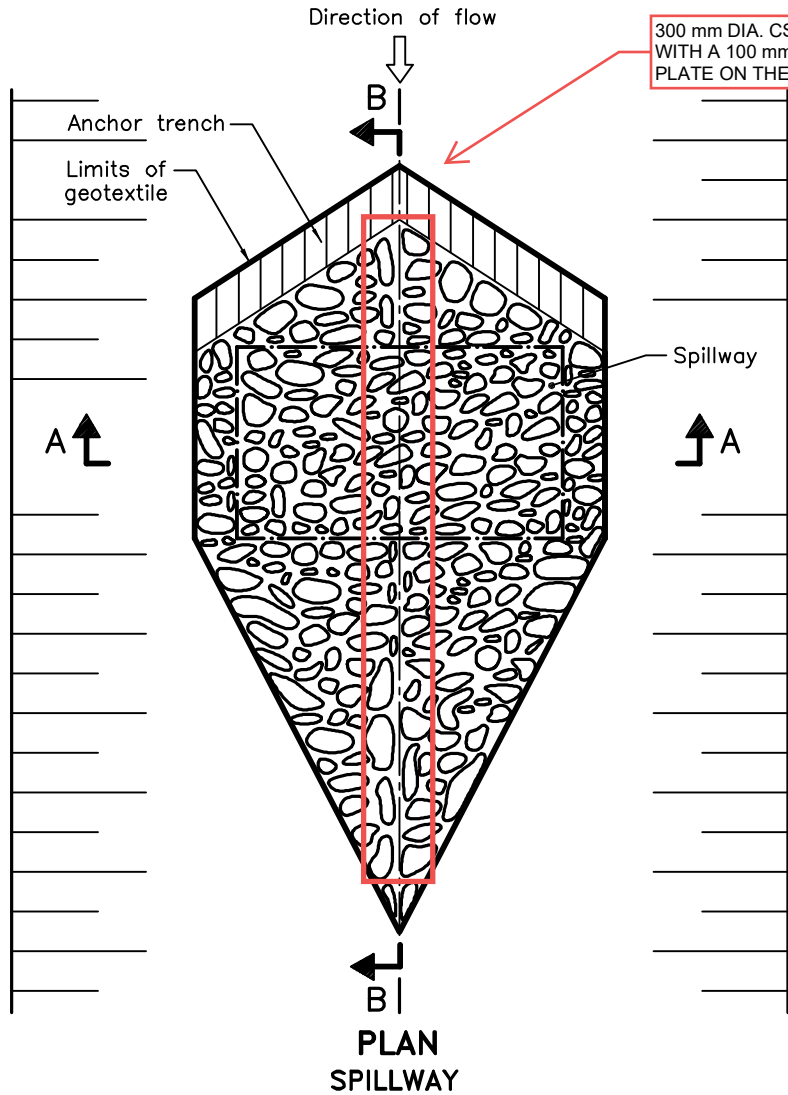
Nov 2021

Rev 3

LIGHT-DUTY  
SILT FENCE BARRIER



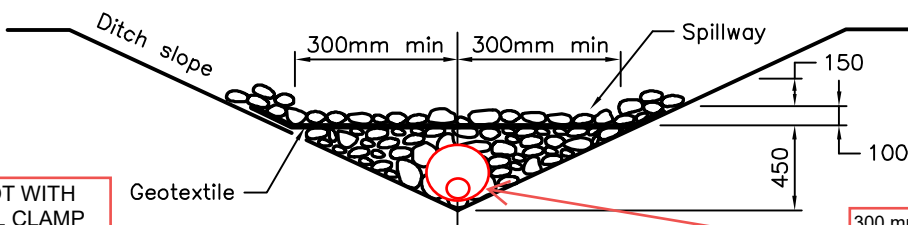
OPSD 219.110



300 mm DIA. CSP CULVERT WITH A 100 mm DIA. ORIFICE PLATE ON THE INLET

MODIFIED ROCK FLOW CHECK DAM (MODIFIED OPSD 219.210) COMPLETED WITH 300 mm DIA. CSP CULVERT WITH A 100 mm DIA. ORIFICE PLATE ON THE INLET

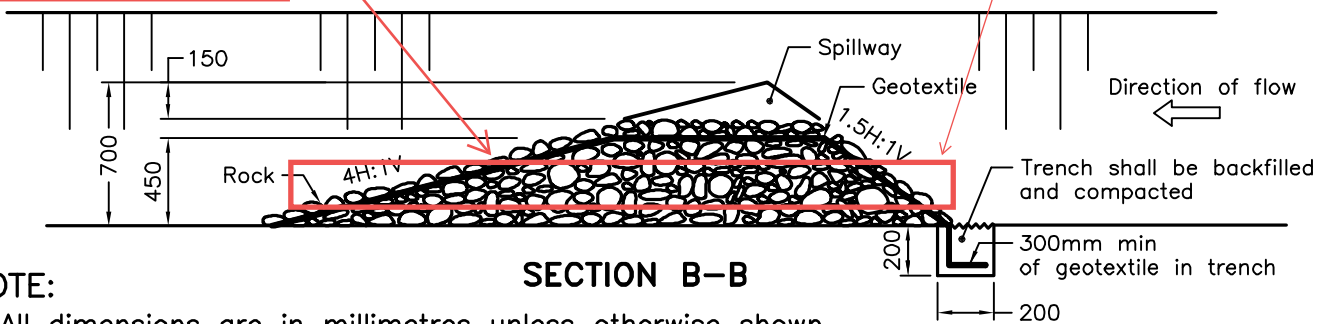
PLAN SPILLWAY



GEOTEXTILE BOOT WITH STAINLESS STEEL CLAMP AROUND CULVERT PROTRUSION

300 mm DIA. CSP CULVERT WITH A 100 mm DIA. ORIFICE PLATE ON THE INLET

SECTION A-A



SECTION B-B

**NOTE:**

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

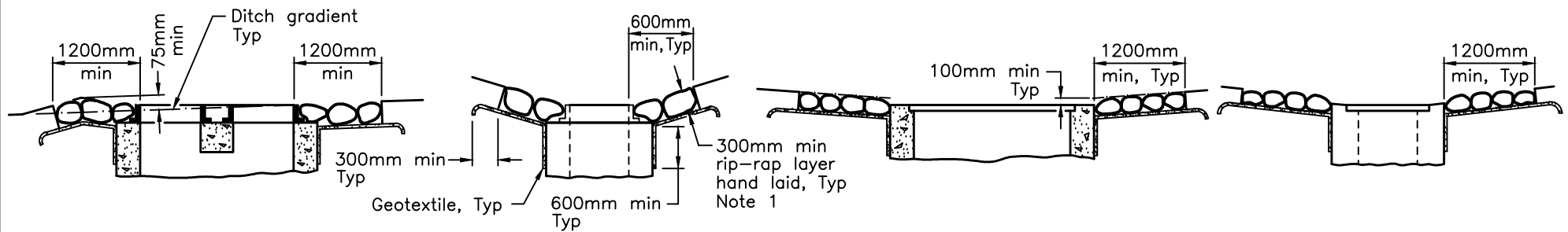
Nov 2015 Rev 2

TEMPORARY  
ROCK FLOW CHECK DAM  
V-DITCH

(MODIFIED)

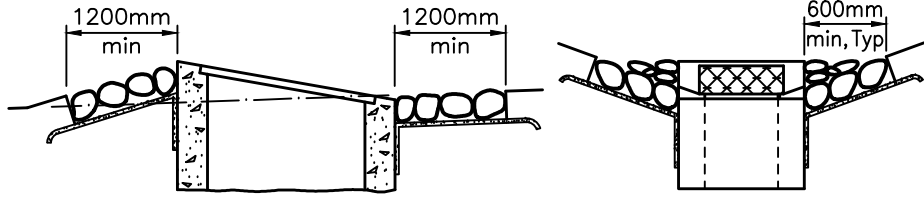


OPSD 219.210

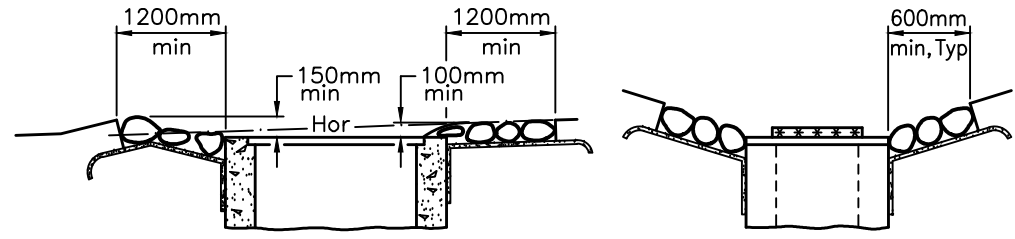


Ditch Longitudinal Section  
Ditch Cross-Section  
**TWIN INLET-INTERMEDIATE**

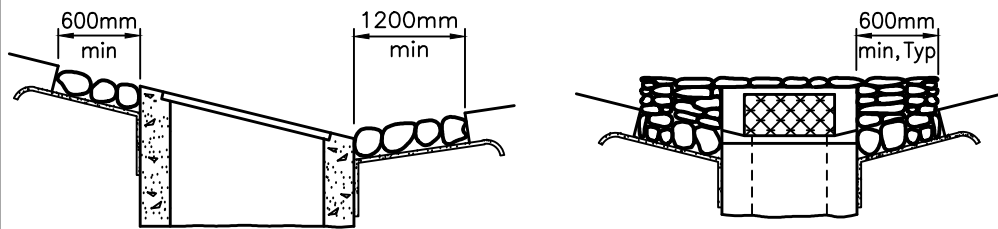
Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-SUMP**



Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-INTERMEDIATE**



Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-INTERMEDIATE**

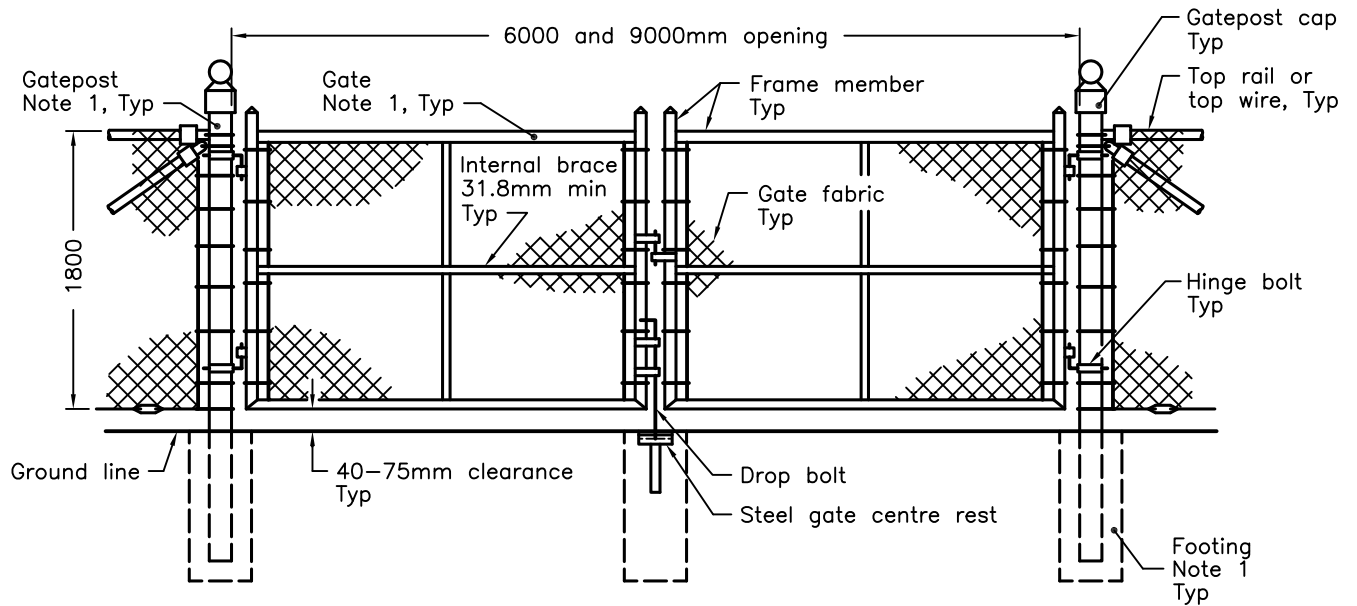


Ditch Longitudinal Section  
Ditch Cross-Section  
**SINGLE INLET-END OF DITCH**

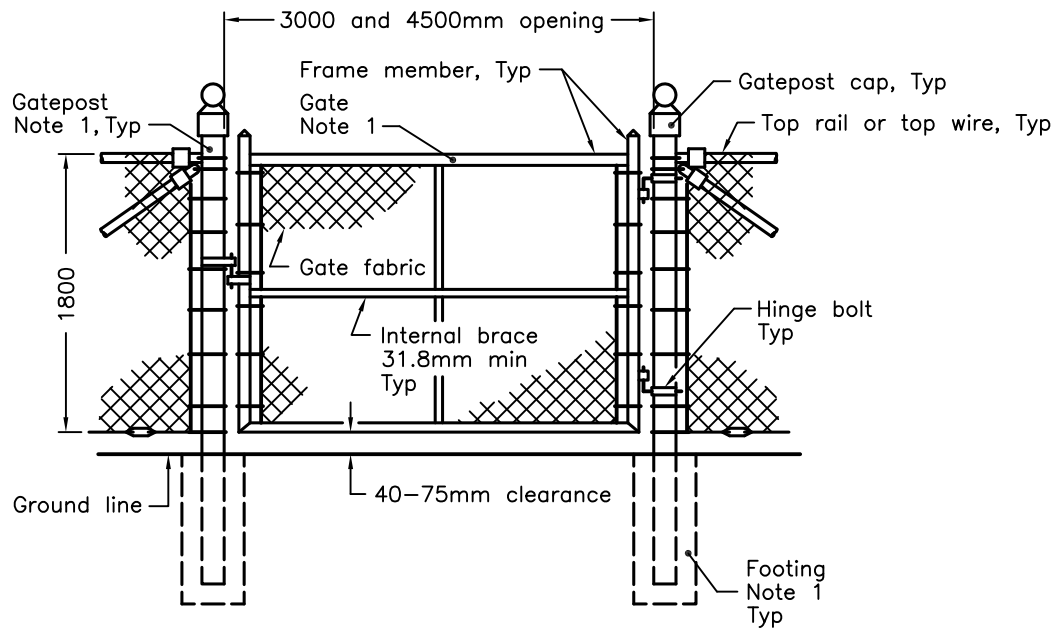
**NOTES:**  
 1 The thickness of the rip-rap layer shall be at least 1.5 times the rip-rap mean diameter.  
 A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING		Nov 2018	Rev	3
<b>GENERAL RIP-RAP LAYOUT FOR DITCH INLETS</b>				
OPSD 810.020				





**DOUBLE SWING GATE OPENING**



**SINGLE SWING GATE OPENING**

**NOTES:**

- 1 For footing details and Gate and Gatepost Details Table refer to OPSD 972.132.
- A Gates as viewed from the roadway.
- B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2012

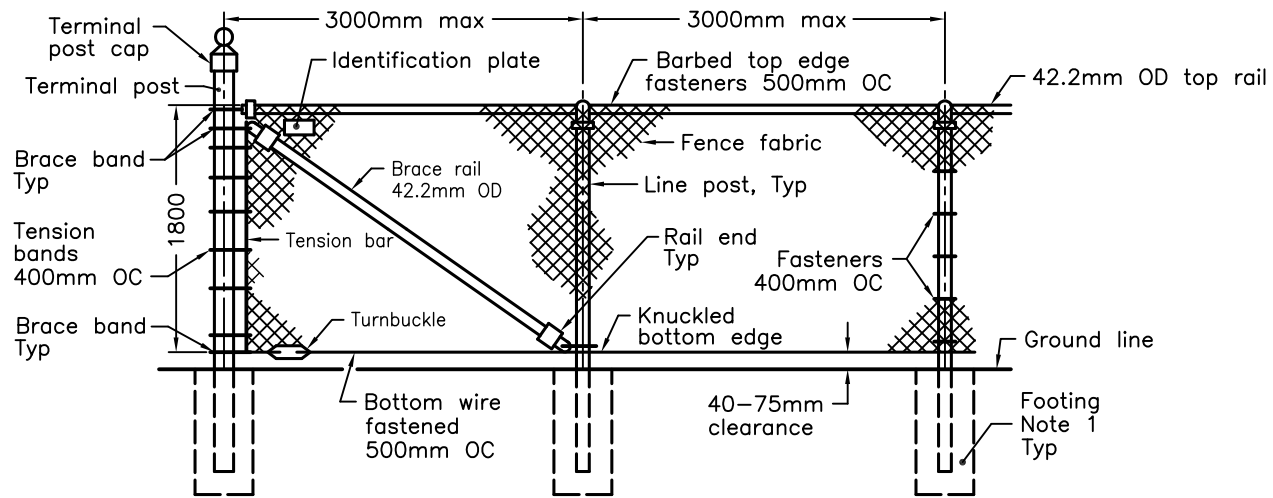
Rev 2

FENCE, CHAIN-LINK  
COMPONENT - GATE

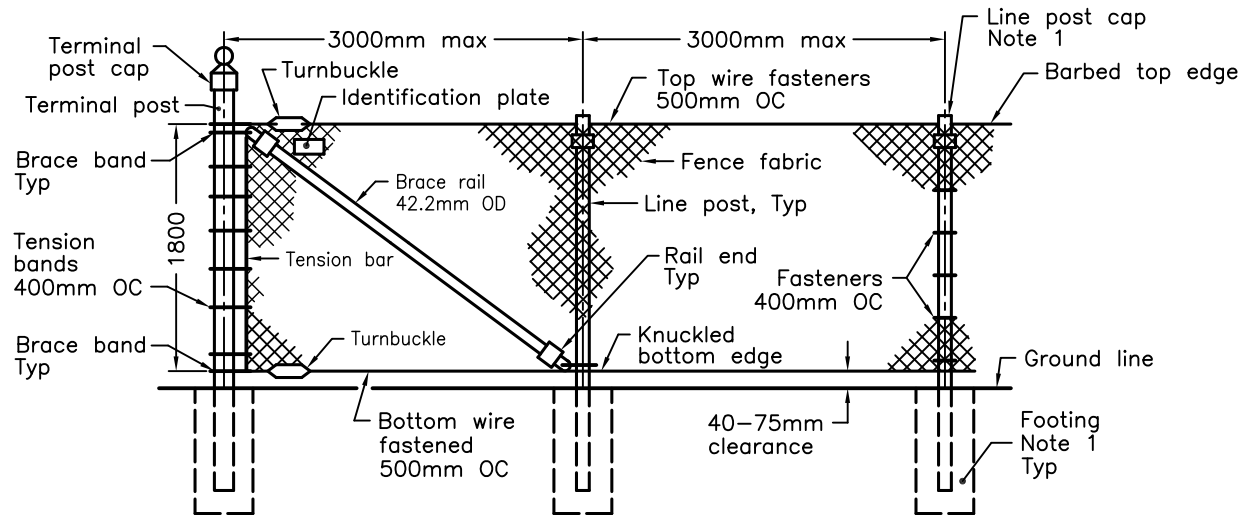


**OPSD 972.102**





**CHAIN-LINK FENCE WITH TOP RAIL**

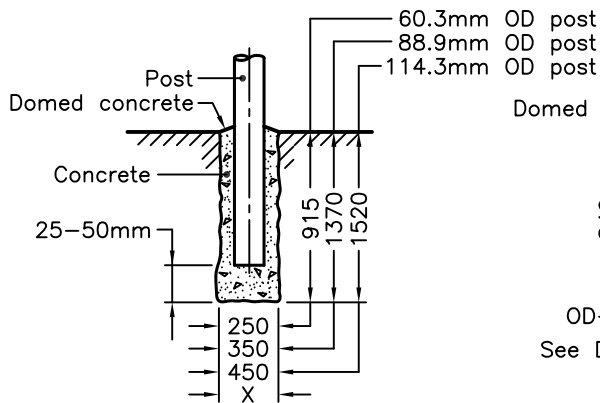


**CHAIN-LINK FENCE WITH TOP WIRE**

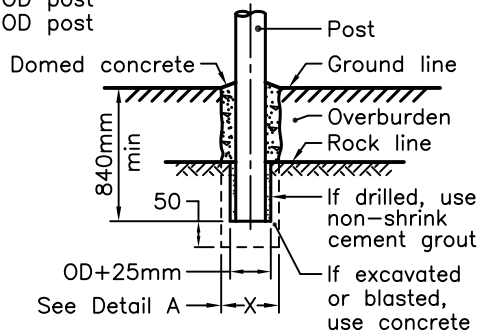
**NOTES:**

- 1 For footing details and line post cap detail refer to OPSD 972.132.
- A Fence as viewed from the roadway.
- B All dimensions are in millimetres unless otherwise shown.

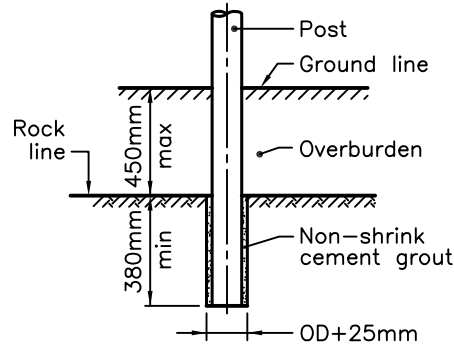
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2	
<b>FENCE, CHAIN-LINK INSTALLATION – ROADWAY</b>	-----		
<b>OPSD 972.130</b>			



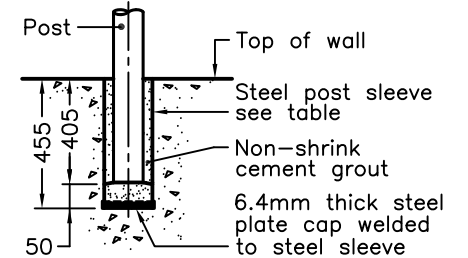
**DETAIL A  
FOOTING IN EARTH**



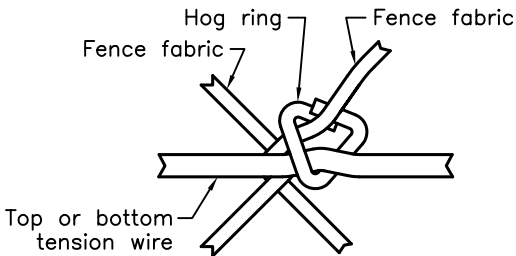
**DETAIL B  
FOOTING IN SHALE, LOOSE  
OR FRIABLE ROCK, OR SOLID  
ROCK WITH MORE THAN 450mm  
OVERBURDEN**



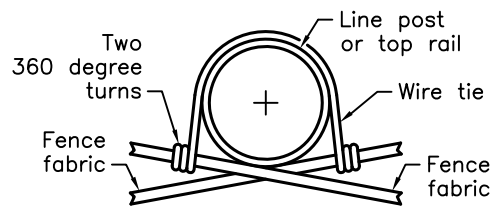
**DETAIL C  
FOOTING IN SOLID ROCK  
LESS THAN 450mm  
OVERBURDEN**



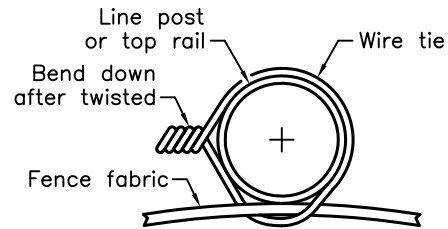
**DETAIL D  
FOOTING IN  
RETAINING WALL**



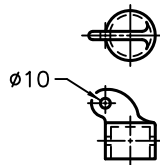
**HOG RING TIE DETAIL**



**MANUALLY FASTENED  
WIRE TIE DETAIL**



**POWER FASTENED  
WIRE TIE DETAIL**



**62mm ID  
LINE POST CAP  
DETAIL**

POST DETAILS TABLE (Note 1)						
Post/Frame Member Type	OD	Post Length		Wall Thickness	Nominal Weight kg/m (Note 2)	
		Standard	Retaining Walls			
		m	m			
Line post	60.3	2.6	2.0	3.91	5.4	
Terminal Post	88.9	2.9	2.3	5.49	11.3	
Gates (Single 3.0m, Double 6.0m)	Gatepost	88.9	2.6	n/a	5.49	11.3
	Frame Members	42.2	n/a	n/a	3.56	3.4
Gates (Single 4.5m, Double 9.0m)	Gatepost	114.3	2.9	n/a	6.02	16.1
	Frame Members	48.3	n/a	n/a	3.68	4.0
Post Sleeves	Line Post	88.9	n/a	0.455	5.49	11.3
	Terminal Post	114.3	n/a	0.455	6.02	16.1

**NOTES:**

- All posts and frame members are Schedule 40, Regular Grade, steel pipe.
- The actual weight shall not vary by more than 10% of the nominal weight.
- All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 0	
FENCE, CHAIN-LINK DETAILS AND TABLE	-----		
	-----		
<b>OPSD 972.132</b>			



**GENERAL SPECIFICATION FOR  
THE MANAGEMENT OF EXCESS MATERIALS**

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**TABLE OF CONTENTS**

<b>180.01</b>	<b>SCOPE</b>
<b>180.02</b>	<b>REFERENCES</b>
<b>180.03</b>	<b>DEFINITIONS</b>
<b>180.04</b>	<b>DESIGN AND SUBMISSION REQUIREMENTS</b>
<b>180.05</b>	<b>MATERIALS - Not Used</b>
<b>180.06</b>	<b>EQUIPMENT - Not Used</b>
<b>180.07</b>	<b>CONSTRUCTION</b>
<b>180.08</b>	<b>QUALITY ASSURANCE - Not Used</b>
<b>180.09</b>	<b>MEASUREMENT FOR PAYMENT - Not Used</b>
<b>180.10</b>	<b>BASIS OF PAYMENT</b>

**APPENDICES**

<b>180-A</b>	<b>Commentary</b>
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**180.01 SCOPE**

This specification covers requirements for the management of excess materials.

Where the management of excess material requirements of other Ontario Provincial Standard Specifications differs from this specification, the requirements of this specification will take precedence.

**180.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **180.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **180.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206      Grading  
OPSS 209      Embankments Over Swamps and Compressible Soils

### **Ontario Provincial Standard Specification, Material**

OPSS 1004    Aggregates, Miscellaneous

### **Canadian and Provincial Statutes**

Environmental Protection Act, R.S.O. 1990, c.E.19-& R.R.O. 1990, Regulation 347  
GENERAL - WASTE MANAGEMENT  
*As amended*

Transportation of Dangerous Goods Act, 1992,  
S.C. 1992, c. 34

Fire Protection and Prevention Act, 1997  
S.O. 1997, CHAPTER 4

### **Provincial Statute**

O. Reg 406/19 On-Site and Excess Soil Management made under the Environmental Protection Act,  
R.S.O. 1990, c.E.19

## Ministry of the Environment, Conservation and Parks (MECP) Publications

### Rules for Soil Management and Excess Soil Quality Standards

#### 180.03 DEFINITIONS

For the purpose of this specification, the definitions in OPSS 182 and the following definitions apply:

**Bituminous Pavement** means any combination of asphaltic material and aggregate, excluding asbestos modified asphaltic material.

**Commercial Waste** means as defined in Regulation 347, under the Environmental Protection Act, Ontario.

**Concrete** means concrete mixtures produced with Portland cement and may include blended hydraulic cement, supplementary cement materials, spent debris and silica sand abrasive blasting media from abrasive cleaning of concrete and reinforcing steel, and concrete brick and block and associated mortar. It may include embedded steel and excludes asbestos modified Portland cement concrete mixtures.

**Disposable Fill** means excess material other than that disposed of at a certified disposal site and that is managed in berms and mounds and as fill other than in road embankments.

**Earth** means as defined in OPSS 206.

**Excess Soil** means as defined in O. Reg 406/19 On-Site and Excess Soil Management.

**Excess Soil Standards** means as defined in O. Reg 406/19 On-Site and Excess Soil Management.

**Excess Material** means material removed under the Work specified in the Contract Documents for which management is not specified and includes surplus and unsuitable materials.

**Ground Water** means subsurface water and water that occurs beneath the water table in soils and rock formations that are fully saturated.

**Manufactured Wood** means wood that is not entirely natural wood.

**Masonry** means clay brick and associated mortar.

**Natural Wood** means stumps, trunks, branches, debris from tree and shrub removal, and wood products that are not treated, coated, or glued.

**Non-Hazardous Solid Industrial Waste** means as defined in Regulation 347, under the Environmental Protection Act, Ontario.

**Qualified Person** means as defined in O.Reg 406/19 On-Site and Excess Soil Management.

**Re-Use** means using, processing, re-processing, or recycling of excess material into a construction material or other useful product and managed by these means for the Contract and other work.

**Reuse Site** means as defined in Rules for Soil Management and Excess Soil Quality Standards.

**Rock** means as defined in OPSS 206.

**Salt-Impacted** means materials that have concentrations of chloride and sodium and values for electrical conductivity and sodium adsorption ratio that could impact the growth of certain types of plants.

**Subject Waste** means as defined as in Regulation 347, under the Environmental Protection Act, Ontario.

**Swamp Material** means as defined in OPSS 209.

**Waste** means excess material that is not managed by re-use, open burning, or as disposable fill and includes any excess material.

## **180.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **180.04.01 Submission Requirements**

#### **180.04.01.01 Notification of Site Selection, and Property Owner Release**

A copy of the completed form OPSF 180-1, Site Selection Notification for Stockpiling Materials Managed Through Re-Use, or OPSF 180-2, Site Selection Notification for Material Managed as Disposable Fill or both shall be submitted to the Contract Administrator and the property owner at least 2 weeks prior to the use of the property. These forms are not required for property owned by the Owner or designated for use in the Contract Documents.

At the completion of such work, a completed copy of the form OPSF 180-3, Property Owner's Release, shall be provided to the Contract Administrator.

The Contractor shall be responsible for any sampling and testing necessary to comply with any requirements imposed by a property owner as a condition of accepting excess material.

#### **180.04.01.02 Verification of Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste**

When excess material is managed by disposal as non-hazardous solid industrial or commercial waste, a copy of the weigh ticket or receipt provided by the disposal site operator shall be submitted to the Contract Administrator on a weekly basis. When such documentation is not available, written confirmation that the waste has been received shall be obtained from the operator of the disposal site and provided to the Contract Administrator within 2 weeks after disposal activities are complete.

Within 3 weeks of the completion of all disposal activities associated with the work, a completed copy of the OPSF 180-5, Waste Quantity Report, shall be provided to the Contract Administrator and shall account for all excess material managed by disposal as solid non-hazardous industrial or commercial waste.

#### **180.04.01.03 Notification of Forest Resource Licensees**

Forest Resource licensees identified in the Contract Documents shall be notified at least 2 weeks prior to commencement of open burning.

#### **180.04.01.04 Environmental Compliance Approval**

When Environmental Compliance Approval(s)/Certificates of Approval for a Waste Management System or a Waste Disposal Site are required, a copy of such approval shall be supplied to the Contract Administrator prior to transporting excess material or waste from the Working Area.

#### **180.04.01.05 Subject Waste Documentation**

For each subject waste listed in the form OPSF 180-4, Subject Waste Classification, that is being shipped from the Working Area to a waste disposal site, the following shall be completed:

- a) The Contract Administrator shall be notified at least 2 weeks prior to the first shipment of subject waste, and at least 24 hours prior to each subsequent shipment of subject waste.
- b) A Regulation 347 manifest with Part B completed by the carrier for each truckload of subject waste, shall be submitted to the Contract Administrator for Part A completion. Copies #1 and #2 of the manifest with Part A and B completed shall be retained by the Contract Administrator and the remaining copies #3 to #6 returned to the carrier.
- c) Copy #6 of the Regulation 347 manifest shall be forwarded to the Contract Administrator at the mailing address indicated on Part A of the manifest, within 4 weeks of the shipment of subject waste from the Working Area.

For each subject waste that is generated by the Contractor's operations and that is not listed in form OPSF 180-4, Subject Waste Classification that is being shipped from the Working Area to a waste disposal site, the following documentation shall be provided to the Contract Administrator.

- a) Prior to shipment of the subject waste:
  - i. Test results from testing to determine the Regulation 347 waste class and characteristics of the subject waste from the Canadian Association for Laboratory Accreditation (CALA) accredited laboratory selected by the Contractor;
  - ii. Notification from the MECP Hazardous Waste Information Network (HWIN) of the registration of the subject waste to obtain a Regulation 347 Generator Registration Number (GRN); and
  - iii. A duplicate of Copy #2 of the Regulation 347 manifest with Parts A and B completed and signed by the generator and carrier respectively.
- b) After shipment of the subject waste:
  - i. Notification of payment of all registration, manifest, and tonnage fees associated with the shipment from the MECP HWIN;
  - ii. A duplicate of Copy #6 of the Regulation 347 manifest with Part C completed and signed by the receiver; and
  - iii. Notification of de-activation of the Regulation 347 GRN in the MECP HWIN.

A record of all test sample numbers and sample dates shall be kept and made available to the Contract Administrator upon request.

**180.04.01.06 Excess Material Audit or Inventory Document**

When an excess material audit or inventory is imposed by statute or is a condition specified in the Contract Documents, a copy of the audit or inventory documents shall be provided to the Contract Administrator.

**180.04.01.07 Alternative Management Condition Approvals**

When certain excess material is to be managed according to the conditions approved in writing by the local district office of MECP and such conditions differ from those specified in Table 1, a copy of such approval shall be provided to the Contract Administrator at least 2 weeks prior to commencement of the work governed by the condition.

**180.04.01.08 Excess Soil Reuse Plan**

A minimum of 14 Days prior to commencing the removal of excess earth from the Working Area, an excess soil reuse plan shall be submitted to the Contract Administrator for excess earth subject to the requirements of O. Reg. 406/19 and Rules for Soil Management and Excess Soil Quality Standards, for information purposes only. Generic excess soil quality standards are specified in Table 3. When required, the services of a qualified person shall be retained according to O.Reg 406/19.

The excess soil reuse plan shall include the following information for each reuse site:

- a) The municipal address (if applicable), latitude and longitude, in NAD83 or WGS84 coordinate system, and description of the reuse site;
- b) The property use of the reuse site and any characteristics associated with the reuse site or nearby properties that may affect the excess soil quality standards applicable to the reuse site;
- c) A description of the undertaking or the identified beneficial purpose for which the excess soil is to be reused;
- d) The estimated quantity of excess soil, including any salt impacted quantities, to be managed at the reuse site and that are necessary for the identified beneficial purpose;
- e) The applicable excess soil quality standards for the reuse site, as determined according to:
  - i. the excess soil standards, and/or;
  - ii. the site-specific excess soil quality standards developed, in accordance with the Rules for Soil Management and Excess Soil Quality Standards, for the reuse site according to the Beneficial Reuse Assessment Tool (BRAT) available on the Government of Ontario website;
- f) Documentation showing that appropriate landowner consultation and disclosure has taken place and confirmation of the site owner's / operator's written consent to accept the excess soil;
- g) Completed copies of OPSF 180-1 and/or OPSF 180-2;
- h) If the reuse site is or will be governed by a site-specific instrument, identify the instrument, the public body responsible for issuing the instrument and any other information relevant to the reuse of excess soil at that site; and
- i) The record keeping/tracking system to be employed, according to the Rules for Soil Management and Excess Soil Quality Standards as applicable, to track excess earth movements during its transportation and placement at the reuse site.

## **180.07 CONSTRUCTION**

### **180.07.01 Conditions on Management of Excess Material - General**

Management of excess material shall be as described in Tables 1 and 2 and the appropriate subsections of this specification unless prior alternative management conditions are approved in writing by MECP.

When an excess material is a mixture of materials, it shall be managed in compliance with the most stringent conditions associated with any of the constituent excess material.

When excess material includes asbestos waste, the asbestos waste shall be managed as specified in the Contract Documents.

Excess materials shall not be permitted in waterbodies and sensitive areas as identified in the Contract Documents, except when re-used according to the appropriate specification.

Excess earth may contain elevated concentrations of chloride and sodium and may have elevated values for electrical conductivity and sodium adsorption ratio. For the purpose of this Contract, excess earth with salt impacts is not considered to be "contaminated" within the meaning of Table 1. Possible salt impacts and applicable legislative requirements shall be considered when excess earth is managed as disposable fill, by stockpiling, or by re-use.



#### **180.07.02 Conditions on Management by Re-Use**

Management of excess material by re-use for incorporation into the work or for other designated re-use shall be as specified in the Contract Documents. Management by re-use shall otherwise be outside the Owner's property. Distance separations described in Table 2 do not apply for the following:

- a) Re-use of excess materials for the same purpose.
- b) Re-use of bituminous pavement, concrete, and masonry within a road right-of-way.
- c) Re-use of concrete as aggregate in bituminous pavement.
- d) Re-use of concrete as rip-rap, gabion stone, or rock protection in compliance with the requirements of OPSS 1004.

Except cutting for construction purposes, excess material consisting of manufactured wood shall not be reprocessed.

#### **180.07.03 Conditions on Management as Disposable Fill**

Management of excess material as disposable fill, including sidecasting of swamp material, within the Owner's property and on other property designated in the Contract Documents shall be as specified in the Contract Documents.

Natural wood and debris from open fires may be managed as disposable fill only within a road right-of-way or on property with a boundary common to a road right-of-way, both within the Contract limits.

Such material shall be top covered by at least 300 mm of earth or topsoil.

#### **180.07.04 Conditions on Management by Open Burning**

Management of excess material by open burning is permitted only when specified in the Contract Documents. Where management by open burning is permitted, it shall be subject to the following conditions and conducted in accordance with the Fire Protection and Prevention Act, 1997 where it applies, and with any applicable, local, municipal by-law(s):

- a) A permit from the Ministry of Natural Resources and Forestry (MNRF) under the Fire Protection and Prevention Act, and/or applicable local or municipal by-law shall be obtained by the Contractor for open burning, as required.
- b) Open burning is prohibited in areas subject to a restricted fire zone order as issued by MNRF or to a smog alert advisory as issued by MECP.

#### **180.07.05 Conditions on Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste**

Management of excess material by disposal as non-hazardous solid industrial or commercial waste at receiving sites designated in the Contract Documents shall be as specified in the Contract Documents.

When receiving sites are not specified in the Contract Documents for management by disposal as non-hazardous solid industrial or commercial waste, such material shall be disposed of at sites identified by the Contractor.

Non-hazardous solid industrial or commercial waste shall be transported from the Working Area directly to a site that has an Environmental Compliance Approval/ Certificate of Approval for a Waste Disposal Site that is valid for non-hazardous solid industrial or commercial waste.

#### **180.07.06 Conditions on Management by Stockpiling**

Management of excess material by stockpiling within the Owner's property and on other property designated in the Contract Documents shall be as specified in the Contract Documents.

Stockpiling shall otherwise be outside the Owner's property.

Stockpiles of bituminous pavement, concrete, and masonry shall be separated according to Table 2 unless either of the following occurs:

- a) Stockpiles are located within a road right-of-way or on property with a boundary common to a right-of-way, both within the Contract limits for a period not exceeding 120 Days.
- b) Stockpiles are located within a provincial or municipal works yard or in a commercially licensed pit or quarry.

For all other excess materials, where Table 1 indicates that stockpiling is subject to management conditions in Table 2, such management conditions only apply to stockpiles that are to be in place for a period exceeding 120 Days.

#### **180.07.07 Conditions on Management by Disposal as Subject Waste**

When an excess material is identified as a dangerous good waste or a subject waste in form OPSF 180-4, Subject Waste Classification, management shall be as follows:

- a) Subject waste shipments shall be manifested and transported directly to a certified waste disposal site.
- b) When the subject waste is also a dangerous good as described in the Transportation of Dangerous Goods Act (TDGA), the carrier shall provide all necessary TDGA labels and placards.

When an excess material generated by the Contractor's operations may be subject waste and it is not identified in form OPSF 180-4, Subject Waste Classification, the Contractor shall be responsible to manage it in accordance with the following:

- a) Conduct sampling and testing using a laboratory certified by the Canadian Association of Laboratory Accreditation (CALA) selected by the Contractor to determine whether it is subject waste and to determine the Regulation 347 waste class and characteristics.
- b) Register all subject waste in the MECP HWIN and obtain a Regulation 347 GRN for disposal.
- c) Package and label all subject waste for transportation and disposal.
- d) Arrange for shipment of all subject waste to a certified waste disposal site using a certified carrier.
- e) Complete Part A of a Regulation 347 manifest including the GRN obtained from the MECP HWIN and provide the manifest to the certified carrier for completion of Part B.
- f) Provide a duplicate of Copy #2 of the Regulation 347 manifest to the Contract Administrator with Parts A and B completed and signed.
- g) Pay all registration, manifest and tonnage fees associated with subject waste disposal in the MECP HWIN.
- h) De-activate the GRN in the MECP HWIN after shipment of all subject waste to a certified waste disposal site is complete and acceptance of the subject waste is acknowledged by the receiver completing and signing Part C of the Regulation 347 manifest.

- i) Provide a duplicate of Copy #6 of the Regulation 347 manifest to the Contract Administrator upon receipt from the receiver.

When an excess material is tested and found not to be a dangerous good waste or a subject waste, it shall be managed according to the Verification of Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste clause.

**180.07.08 Excess Earth Quantity Report**

A completed form OPSF 180-6, Excess Earth Quantity Report, shall be submitted to the Contract Administrator not less than 3 Business Days prior to all regularly scheduled site meetings, for information purposes only. The submittal shall account for all excess earth managed as disposable fill, by stockpiling, and by re-use. Revisions shall be highlighted. The form shall confirm the submission date of the corresponding Notification of Site Selection and Property Owner Release forms to the Contract Administrator. A final completed Quantity Report Form OPSF 180-6, shall be submitted to the Contract Administrator prior to Contract Completion, for information purposes only.

**180.07.09 Verification of Excess Soil Reuse Plan**

Within 14 Days of the completion of the excess soil reuse plan, a report including records shall be submitted to the Contract Administrator, verifying that excess soil has been placed to the correct reuse site(s) for the quantity and the beneficial purpose identified in the excess soil reuse plan, as amended, for information purposes only. Amendments to the plan shall be identified in the report.

**180.10 BASIS OF PAYMENT**

Payment for the management of excess material shall be included in the tender items requiring such management and shall include all costs associated with acquiring approvals, releases, and agreements.

Payment for the management of excess material that is subject waste generated by the Contractor's operations and not listed in form OPSF 180-4 by the Owner, and is in addition to the cost of disposal as non-hazardous, solid industrial, or commercial waste, shall be paid as Extra Work, with provisions subject to testing to verify that the excess material is subject waste.

**Table 1  
Excess Material Management Conditions**

Excess Material Description	Subsection in This Specification				
	Conditions on Management by Re-Use	Conditions on Management as Disposable Fill	Conditions on Management by Open Burning	Conditions on Management by Disposal as Non-hazardous Solid Industrial or Commercial Waste	Conditions on Management by Stockpiling
Earth	Yes	Yes	n/a	Yes	Yes
Swamp Material	Yes	Yes Table 2	n/a	Yes	Yes Table 2
Aggregate	Yes	Yes	n/a	Yes	Yes
Rock	Yes	Yes	n/a	Yes	Yes
Bituminous Pavement	Yes Table 2	Not Permitted	n/a	Yes	Yes
Concrete	Yes Table 2	Not Permitted	n/a	Yes	Yes
Masonry	Yes Table 2	Not Permitted	n/a	Yes	Yes
Manufactured Wood	Yes	Not Permitted	Not Permitted	Yes	Yes Table 2
Natural Wood	Yes	Yes Table 2	Yes	Yes	Yes Table 2
Debris From Open Fires	n/a	Yes Table 2	n/a	Yes	Yes Table 2
Metal/Plastic Polystyrene Products	Yes	Not Permitted	Not Permitted	Yes	Yes
Subject Waste	Subject waste shall be managed as specified in the subsection for Conditions on Management by Disposal as Subject Waste.				
Materials Suspected of Being Contaminated	When excess materials that were not generated by the Contractor's operations and are not listed in form OPSF 180-4, Subject Waste Classification, are suspected of being contaminated, direction on their management shall be obtained from the Contract Administrator.				
Other Materials	Excess materials that are not listed above shall be managed as specified in the subsection for Conditions on Management by Disposal as Non-Hazardous Solid Industrial or Commercial Waste, unless prior alternative management conditions are approved in writing by the Ministry of Environment, Conservation and Parks.				

**Table 2**  
**Excess Material Management Distance Separation Requirements**

<b>Adjacent Feature</b>	<b>Minimum Distance Separation</b>
Ground Water	2 m (Above)
Waterbodies	30 m
Water Wells	100 m
Residences	100 m

## SITE SELECTION NOTIFICATION FOR STOCKPILING MATERIALS MANAGED THROUGH RE-USE

### Contract Information

Contract No: \_\_\_\_\_ Owner: \_\_\_\_\_

The following describes the notification process between the Owner of the Contract and the Contractor, wherein the Contractor formally notifies the Owner that agreement has been reached with a third party property owner for the stockpiling of Contract generated excess material. Such excess material, stockpiled for re-use or disposal, may be one or a combination of: earth; aggregate; swamp material; rock; concrete; masonry; bituminous pavement; natural wood; metal, plastic, and polystyrene; wood which has been treated, coated, or glued; and debris from open fires, provided the conditions on management are satisfied.

### Site Information

Registered Property Owner(s) for the subject property: \_\_\_\_\_

The subject property use description: \_\_\_\_\_

Lot \_\_\_\_\_, Concession \_\_\_\_\_, Township of \_\_\_\_\_

County/Region/District of \_\_\_\_\_

Quantity (tonnes/cubic metres) and Type of Excess Material stockpiled: \_\_\_\_\_

This is to notify you, as Owner, that permission has been obtained from the property owner(s) named herein for the management of excess materials through re-use from this Contract. The property owner has signed and been provided with a copy of this form and has been advised that the Site Selection Notification for Material Managed as Disposable Fill Form, OPSF 180-2 (for excess soil management), and a Property Owner's Release Form, OPSF 180-3, will also be required. The use of this management site will comply with the following:

### Conditions on Management

It is understood that materials are stockpiled to be re-used or held for disposal at a certified waste disposal site. Stockpiles of natural wood, manufactured wood, debris from open fires, and swamp material may only be located:

- a) A minimum of 2 m above the level of ground water.
- b) A minimum of 30 m from waterbodies.
- c) A minimum of 100 m from any water wells.
- d) A minimum of 100 m from residences.

Stockpiles of bituminous pavement, concrete, and masonry may only be located:

- a) A minimum of 30 m from waterbodies; and
- b) A minimum of 100 m from residences unless
  1. on property with a boundary common to a right-of-way, within the contract limits for a period not exceeding 120 calendar days, or
  2. such stockpiles are located within a provincial or municipal works yard or in a commercially licensed pit or quarry.

This form to be used with Ontario Provincial Standard Specification 180

I/We state that I/we are the registered owner(s) of the property identified above and I/we agree to sign the Property Owner's Release after the Contractor has placed the excess material on the above-noted property in accordance with the terms of this form.

These conditions do not supersede any constraints imposed on this property by Federal, Provincial or Municipal, including Conservation Authority, statute or regulations and bylaws made thereto.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Print Contractor's Name & Field Representative's Name

\_\_\_\_\_  
Contractor's Field Representative Signature

\_\_\_\_\_  
Print Registered Property Owner's Name (s)

\_\_\_\_\_  
Registered Property Owner's Signature(s)

cc: Contract Administrator, Property Owner(s), Contractor

## SITE SELECTION NOTIFICATION FOR MATERIAL MANAGED AS DISPOSABLE FILL

### Contract Information

Contract No: \_\_\_\_\_ Owner: \_\_\_\_\_

The following describes the notification process between the Owner of the Contract and the Contractor, wherein the Contractor formally notifies the Owner that agreement has been reached with a third-party property owner for the disposition of Contract generated excess material. Such excess material, managed as disposable fill, shall be limited to one or a combination of: earth, aggregate, swamp material, rock, natural wood, and debris from open fires, provided the conditions on management are satisfied.

### Site Information

Registered Property Owner(s) for the subject property: \_\_\_\_\_

The subject property use description: \_\_\_\_\_

Lot \_\_\_\_\_, Concession \_\_\_\_\_, Township of \_\_\_\_\_

County/Region/District of \_\_\_\_\_

Quantity (tonnes/cubic metres) and Type of Excess Material stockpiled: \_\_\_\_\_

### For Excess Soil Management

A description of the beneficial purpose for which the Excess Soil is to be reused at this site:

\_\_\_\_\_

The Excess Soil Quality Standards that apply to this site:

\_\_\_\_\_

Confirmation that Excess Soil Quality Standards applicable to this site align with the quality of excess soil to be brought to this site:

\_\_\_\_\_

This is to notify you, as Owner, that permission has been obtained from the property owner(s) named herein for the management of excess materials from this Contract. The property owner has signed and been provided with a copy of this form and has been advised that a Property Owner's Release Form, OPSF 180-3, will also be required. The use of this management site will comply with the following:

### Conditions on Management

Swamp material, natural wood, and debris from open fires managed as disposable fill will be top covered by a minimum of 300 mm of earth or topsoil. Swamp material, natural wood, and debris from open fires managed as disposable fill may only be placed:

- a) A minimum of 2 m above the level of ground water.
- b) A minimum of 30 m from waterbodies
- c) A minimum of 100 m from any water wells
- d) A minimum of 100 m from residences.



**Salt-Impacted Excess Soil may only be placed:**

- a) Where it is reasonable to expect that the soil will be affected by the same chemicals as a result of continued application of a substance for the safety of vehicular or pedestrian traffic under conditions of snow or ice; or
- b) With an industrial or commercial property use and to which non-potable water standards would be applicable; or
- c) That is at least 1.5 m below the surface of the soil.

**Salt-Impacted Excess Soil shall not be finally placed:**

- a) Within 30 m of a waterbody;
- b) Within 100 m of a potable water well or area with an intended property use that may require a potable water well; or
- c) In lands that will be used for growing crops or pasturing livestock unless the excess soil is placed 1.5 m or greater below the soil surface.

I/We state that I/we are the registered owner(s) of the property identified above and I/we agree to sign the attached form of Property Owner's Release after the Contractor has placed the excess material on the above-noted property in accordance with the terms of this form.

These conditions do not supersede any constraints imposed on this property by Federal, Provincial, or Municipal, including Conservation Authority, statute or regulations and bylaws made thereto.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Print Contractor's Name & Field Representative's Name

\_\_\_\_\_  
Contractor's Field Representative Signature

\_\_\_\_\_  
Print Property Owner's Name(s)

\_\_\_\_\_  
Registered Property Owner's Signature(s)

cc: Contract Administrator, Property Owner(s), Contractor

**PROPERTY OWNER'S RELEASE**

Contract No: \_\_\_\_\_

Work Description: \_\_\_\_\_

I/We \_\_\_\_\_ being the owner(s) of Lot, \_\_\_\_\_

Concession \_\_\_\_\_, Township of \_\_\_\_\_, and County/Region/District of \_\_\_\_\_, verify that the Contractor for the above noted work has placed excess material from the above noted Contract on my/our property with my/our permission. I/We have signed together with the Contractor forms OPSF 180-1, Site Selection Notification for Stockpiling Materials Managed Through Re-Use, or OPSF 180-2, Site Selection Notification for Material Managed as Disposable Fill, or both, that describe Conditions on Management, and have been assured by the Contractor that these conditions have been met.

Quantity (tonnes/cubic metres) and Type of Excess Material used as fill:

Where materials are managed as disposable fill, I/we agree to be responsible for any subsequent relocation and management of the material so placed.

Quantity (tonnes/cubic metres) and Type of Excess Material stockpiled:

Where materials are to be stockpiled, I/We agree that the stockpile(s) will be removed by the date(s) herein noted:

For materials managed as Excess Soil, the Quantity (tonnes/cubic metres) and the Identified Beneficial Purpose for which the Excess Soil was reused:

For Salt-Impacted Excess Soil, the Quantity (tonnes/cubic metres) and the Identified Beneficial Purpose for which the Excess Soil was reused:

I/We state that I/we are the registered owner(s) of the property identified above and I/we hereby release the Owner and the Contractor in respect of the activities of the Contractor carried out in accordance with this release.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

\_\_\_\_\_  
Print Registered Property Owner's Name (s)

\_\_\_\_\_  
Registered Property Owner's Signature(s)

\_\_\_\_\_  
Print Contractor's Name & Field Representative's Name

\_\_\_\_\_  
Contractor's Field Representative Signature

cc: Contract Administrator, Property Owner(s), Contractor

### SUBJECT WASTE CLASSIFICATION

The following named waste is to be disposed of as a subject waste:

---

The classification of the above waste is as follows:

Shipping Name of Waste	
Reg. 347 Classification	
TDGA Identification No. (PIN)	
TDGA Classification	
TDGA Packaging Group	
Volume of Waste	
Container Type and Condition	

The following named waste is to be disposed of as a subject waste:

---

The classification of the above waste is as follows:

Shipping Name of Waste	
Reg. 347 Classification	
TDGA Identification No. (PIN)	
TDGA Classification	
TDGA Packaging Group	
Volume of Waste	
Container Type and Condition	

cc: Contract Administrator, Property Owner(s), Contractor

**WASTE QUANTITY REPORT**

For Solid Non-Hazardous Industrial and Commercial Waste

Contract No: \_\_\_\_\_

Contractor: \_\_\_\_\_

Material Description	Location of Disposal Site and Certificate of Approval Number	Quantity of Materials

cc: Contract Administrator, Property Owner(s), Contractor

### Excess Soil Quantity Report

For Excess Soil Managed by Stockpiling, Re-Use and as Disposable Fill

Contract No: \_\_\_\_\_ Progress Meeting Date: \_\_\_\_\_

Contract Description: \_\_\_\_\_

Contractor: \_\_\_\_\_

Print Name of Person Completing this Form: \_\_\_\_\_

Signature: \_\_\_\_\_

Date	Type of Placement S = Stockpiled D = Disposable Fill R = Beneficial Re-use	Location of Material Placement	Estimated Quantity of Material Placed (M <sup>3</sup> )	Site Selection Notification Submission Date (Form OPSF 180-1 or OPSF 180-2)	Property Owner's Release Submission Date (Form OPSF 180-3)
<b>Final Quantities</b>		<b>Stockpiled</b>		<b>m<sup>3</sup></b>	
		<b>Disposable Fill</b>		<b>m<sup>3</sup></b>	
		<b>Beneficial Re-use</b>		<b>m<sup>3</sup></b>	

Cc: Contract Administrator, Property Owner(s), Contractor

OPSF 180-6 (July 2021)

## **Appendix 180-A, November 2021 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.**

### **Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Property available for stockpiling for re-use and disposal of fill, or management as disposable fill of excess materials. (180.04.01.01)
- Forest resource licensees within the Contract limits. (180.04.01.03)
- Excess material audit or inventory when required. (180.04.01.06)
- Generic excess soil quality standards (Table 3). (10.04.01.8)
- Management conditions of materials with asbestos waste. (180.07.01)
- Identification of waterbodies and sensitive areas. (180.07.01)
- Management by re-use. (180.07.02)
- Management of disposable fill within the Owner's property and on other property. (180.07.03)
- Conditions on management by open burning. (180.07.04)
- Management by disposal of non-hazardous solid industrial or commercial waste. (180.07.05)
- Receiving sites. (180.07.05)
- Management by stockpiling within the Owner's property or on other property. (180.07.06)
- Management of dangerous good waste or subject waste. (180.07.07)

Clauses 180.04.01.01 and 180.04.01.08 require the use of OPSF 180-1 as a Site Selection Notification for Stockpiling Materials Managed Through Re-Use Form, and/or OPSF 180-2 as a Site Selection Notification for Material managed as Disposable Fill. Clause 180.04.01.01 requires the use of OPSF 180-3 as a Property Owner's Release Form. Clauses 180.04.01.05, 180.07.07, 180.10, and Table 1 require the use of OPSF 180-4 as a Subject Waste Classification Form. 180.04.01.02 requires the use of OPSF 180-5 as a Waste Quantity Report Form. Subsection 180.07.08 requires the use of OPSF 180-6 as an Excess Earth Quantity Report. If any form(s) other than OPSF 180-1, OPSF 180-2, OPSF 180-3, OPSF 180-4, OPSF 180-5, or OPSF 180-6 will be used for submission purposes, the alternate form(s) should be invoked by reference in the Contract Documents and the specification should be amended to remove reference to the OPSF(s).

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Table 3  
Generic Excess Soil Quality Standards**

<b>Township</b>	<b>Station (Offset)</b>	<b>Excavation Depth Range</b> <small>(Note 1)</small>	<b>Generic Excess Soil Quality Standard</b> <small>(Note 2)</small>	<b>Property Use</b> <small>(Note 3)</small>
*	*	*	*	*

Notes:

1. Depth as measured from the original ground surface.
2. Values refer to the table number in Appendix 1 of Rules for Soil Management and Excess Soil Quality Standards.
3. Values are acronyms coinciding with table headings in Appendix 1 of Rules for Soil Management and Excess Soil Quality Standards.  
 AO = Agricultural and Other Property Use,  
 RPIICC = Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use,  
 RPI = Residential/Parkland/Institutional Property Use,  
 ICC = Industrial/Commercial/Community Property Use,  
 (Surf) = Surface, and (Sub) = Subsurface.

Designer Fill-Ins for Table 3:

Fill in Table 3 based on information supplied by environmental project team members, or within an environmental or geotechnical report. When the appropriate soil quality standard is uncertain, specify the more restrictive standard.

Example Fill-Ins for Table 3:

<b>Township</b>	<b>Station (Offset)</b>	<b>Excavation Depth Range</b> <small>(Note 1)</small>	<b>Generic Excess Soil Quality Standard</b> <small>(Note 2)</small>	<b>Property Use</b> <small>(Note 3)</small>
Cameron	12+300 – 17+546		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Cameron	17+546 – 18+912	0 – 2.5 m	Table 3: Ceiling Values for Full Depth Excess Soil in a Non-Potable Ground Water Condition	RPI
Cameron	17+546 – 18+912	2.5 m – 7 m	Table 2.1: Ceiling Values for Full Depth Excess Soil in a Potable Ground Water Condition	ICC
Cameron	18+912 – 21+640		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Jacob	10+000 – 13+460		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Jacob	13+460 – 14+125 (2 m Lt – 14 m Rt)		Table 4.1: Ceiling Values for Stratified Excess Soil in a Potable Ground Water Condition	ICC (Sub)
Jacob	13+460 – 14+125 (12 m Lt – 2 m Lt)		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC
Jacob	14+125 – 19+567		Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC

Example Fill-Ins for Table 3:

<b>Township</b>	<b>Station (Offset)</b>	<b>Excavation Depth Range</b> <small>(Note 1)</small>	<b>Generic Excess Soil Quality Standard</b> <small>(Note 2)</small>	<b>Property Use</b> <small>(Note 3)</small>
Entire Working Area			Table 1: Ceiling Values for Excess Soil Reuse	AO, RPIICC

**Related Ontario Provincial Standard Drawings**

No information provided here.





**Note:** The MUNI implemented in April 2019 replaces OPSS 201 COMMON, November 2011 with no technical content changes.

**CONSTRUCTION SPECIFICATION FOR  
CLEARING, CLOSE CUT CLEARING, GRUBBING,  
AND REMOVAL OF SURFACE AND PILED BOULDERS**

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**APPENDICES**

<b>201-A</b>	<b>Commentary</b>
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<b>201.01</b>	<b>SCOPE</b>
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This specification covers the requirements for the removal of trees, brush, bushes, stumps, windfalls, surface boulders, and piled boulders.

**201.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **201.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **201.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206 Grading

### **Ontario Government Publications**

Crown Forest Sustainability Act, 1994, S.O. 1994, c. 25

## **201.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Clearing** means the cutting of all standing trees, brush, bushes, and other vegetation to a maximum height of 300 mm above original ground level and the removal of felled materials and windfalls.

**Close Cut Clearing** means the cutting of all standing trees, stumps, brush, bushes, and other vegetation at original ground level and the removal of felled materials and windfalls.

**Grubbing** means the removal of all stumps, roots, embedded logs, debris, and secondary growth.

**Piled Boulders** means any cobbles, boulders, or rock fragments that have been placed in fencerows or piles.

**Rock** means rock as defined in OPSS 206.

**Surface Boulder** means any boulder or rock fragment that measures 200 mm or greater in any one dimension, extends a minimum of 200 mm above original ground, and can be removed without excavation.

## **201.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **201.04.01 Submission Requirements**

#### **201.04.01.01 Crown Forest**

Crown forest, as defined by the Crown Forest Sustainability Act, shall not be cut until a permit has been obtained from the Ministry of Natural Resources and Forestry (MNR).

## **201.07 CONSTRUCTION**

### **201.07.01 General**

Trees measuring 150 mm or more in diameter, measured 1.0 m above ground, shall be cut, limbed, and stacked for collection by others. Cut trees shall not be stacked in or transported through areas identified as being environmentally sensitive in the Contract Documents or elsewhere by an Authority.

When specified in the Contract Documents, cut trees shall be stacked outside and adjacent to the right-of-way for the property owner, adjacent to and between the stations listed.

Within Crown Land areas specified in the Contract Documents for clearing and close cut clearing, marketable timber shall be made available for purchase from the Contractor to the holder of the sustainable forest licence. All cut and stacked trees shall be cut into lengths agreed to by the Contractor and the sustainable forest licence holder, but in no case exceeding 5.0 m.

All timber not purchased by others or stacked for adjacent landowners is excess material.

The work shall not damage or disturb the area outside the areas specified in the Contract Documents.

When work is done in or near waterbodies or waterbody banks, the work shall be according to the Contract Documents.

#### **201.07.02 Clearing**

The work shall consist of clearing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height, and any other areas specified in the Contract Documents.

#### **201.07.03 Close Cut Clearing**

The work shall consist of close cut clearing all earth surfaces to be covered by embankments greater than 1.2 m in height, and any other areas specified in the Contract Documents.

#### **201.07.04 Grubbing**

The work shall consist of grubbing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height, and any other areas specified in the Contract Documents.

Grubbing is not required in swamps.

Mechanical stump cutters are permitted, provided the entire root structure is removed.

Depressions remaining after grubbing shall be backfilled with suitable earth material and compacted to avoid settlement.

When clearing has been previously completed by others, all secondary growth, brush, and debris shall be removed.

Piled boulders and surface boulders that are not specified in the Contract Documents for removal and lie within areas to be grubbed shall be removed.

**201.07.05                      Removal of Surface Boulders and Removal of Piled Boulders**

The work shall consist of the removal of surface boulders and removal of piled boulders within the areas specified in the Contract Documents.

Depressions remaining after removal shall be backfilled with suitable earth material and compacted to avoid settlement.

**201.07.06                      Mechanical Stump Cutting**

The work shall consist of mechanical cutting of stumps to a depth of 150 mm below original grade, as specified in the Contract Documents.

**201.07.07                      Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**201.09                              MEASUREMENT FOR PAYMENT**

**201.09.01                      Actual Measurement**

Measurement shall be by area or by each, as specified in the Contract Documents.

**201.09.01.01                      Clearing, Close Cut Clearing, and Grubbing**

Measurement of clearing, close cut clearing, and grubbing shall be by area or by each, as specified in the Contract Documents.

**201.09.01.01.01                      By Area**

Removal shall be measured by area in a horizontal plane in hectares or square metres.

**201.09.01.01.02                      By Each**

For measurement purposes, a count shall be made of the trees or stumps removed.

**201.09.01.02                      Removal of Surface Boulders and Removal of Piled Boulders**

Removal shall be measured by area in a horizontal plane in hectares or square metres.

**201.09.01.03                      Mechanical Stump Cutting**

For measurement purposes, a count shall be made of the stumps removed by mechanical cutting.

**201.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**201.10 BASIS OF PAYMENT**

- 201.10.01 Clearing - Item**
- Close Cut Clearing - Item**
- Grubbing - Item**
- Removal of Surface Boulders - Item**
- Removal of Piled Boulders - Item**
- Mechanical Stump Cutting - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Areas designated for removal of piled boulders that lie within areas specified in the Contract Documents for either grubbing or removal of surface boulders shall be paid separately with no deduction from the grubbing or surface boulder removal item.

Removal of individual boulders that are 1 m<sup>3</sup> and greater in volume, shall be paid as rock excavation according to OPSS 206.

## **Appendix 201-A, April 2019 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Areas identified for clearing, close cut clearing, grubbing, removal of surface boulders and removal of piled boulders, and mechanical stump cutting, in addition to those areas required by this specification. (201.07)
- Areas identified as being environmentally sensitive. (201.07.01)
- Areas for clearing and close cut clearing within Crown Land. (201.07.01)
- Areas where cut trees are to be stacked. (201.07.01)
- The areas where work is to be done in or near waterbodies or waterbody banks. (201.07.01)
- Review crown land clearing with Ministry of Natural Resources and Forestry (MNRF) to determine volume of marketable timber available. (201.07.01)
- Identify holders of sustainable forest licences and their addresses from the MNRF and make them available to the Contractor. (201.07.01)
- Method of measurement for clearing, close cut clearing, and grubbing. (201.09.01.01)

When surface boulders and piled boulders are to be removed that are outside the general grading limits, the Removal of Surface Boulders and Removal of Piled Boulders items should be used.

Swamp excavation areas do not require grubbing, therefore, designers should not include a grubbing quantity in the Contract Documents for these areas.

The designer should include an additional quantity for individual boulders over 1 m<sup>3</sup> in the rock excavation quantity. (201.10.01)

Mechanical stump cutting should be considered to avoid damage to adjacent structures that may result from grubbing.

Piled boulders greater than 100 m<sup>3</sup> should be designated for removal and be included for payment in the tender item for Removal of Piled Boulders regardless of where they are located.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

### **Related Ontario Provincial Standard Drawings**

No information provided here.



**CONSTRUCTION SPECIFICATION FOR  
GRADING**

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**APPENDICES**

<b>206-A</b>	<b>Commentary</b>
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**206.01 SCOPE**

This specification covers the requirements for grading, including earth and rock excavation and embankment construction, rock face, and the management of excavated materials.

**206.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **206.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **206.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 201	Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders
OPSS 209	Embankments Over Swamps and Compressible Soils
OPSS 212	Borrow
OPSS 501	Compacting
OPSS 802	Topsoil
OPSS 804	Seed and Cover

### **Ontario Provincial Standard Specifications, Materials**

OPSS 1001	Aggregates - General
OPSS 1010	Aggregates - Base, Subbase, Select Subgrade and Backfill Material

### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:	
LS-706	Moisture-Density Relationship of Soils Using 2.5 kg Rammer and 305 mm Drop

## **206.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Angle of Repose** means the maximum angle measured from the horizontal at which fill remains stable.



**Backslope** means the slope in a cut between the invert of the roadside ditch and the point where the slope intersects original ground.

**Benching** means the keying into existing slopes by excavating horizontal planes. Benching also means the stepping of cut slopes at intermediate levels in deep cuts.

**Berm(s)** means an extension of an embankment constructed to a lower height and designed to provide road embankment stability.

**Bulking Factor** means the ratio of the volume of rock material following excavation, placement, and compacting to the original in situ volume of the same material. The bulking factor for rock shall be 1.35.

**Cushion Blasting** means the placing of a single row of lightly-loaded closely-spaced holes along the excavation limits as specified in the Contract Documents and firing them coincident with the main excavation blast as the last delay sequence to remove rock inside the cut limits.

**Ditching** means the excavation in earth or rock for all water courses. The term shall include roadside ditches, all excavation lying beyond the end of drainage structures, and stream and watercourse diversions and corrections.

**Earth** means all soils, except those defined as rock, and excludes stone masonry, concrete, and other manufactured materials.

**Embankment** means the material placed within the sideslopes; below the top of subgrade; and above the original ground, excavated base, or theoretical bottom, as applicable, to the limits as specified in the Contract Documents. Widening, flattening, or other placement of material adjacent to or on top of sideslopes beyond that specified in the Contract Documents is excluded.

**Existing Rock Surface** means either the rock surface that is exposed at ground level prior to the beginning of the Contract or the rock surface that is exposed after the overburden above it has been removed during the Contract.

**Frontslope** means the slope in a cut section between the edge of shoulder and the invert of the roadside ditch.

**Grubbing** means grubbing as defined in OPSS 201.

**Line Drilling** means the placing of a single row of very closely-spaced holes without explosives along the rock excavation limits as specified in the Contract Documents.

**Mucking** means the picking up of broken rock prior to haulage.

**Overbreak** means any broken, displaced, or loosened rock that originates outside the designated rock excavation limits as specified in the Contract Documents, regardless of whether that rock has been excavated, displaced, or loosened due to the inherent character of the rock formation itself or due to any other cause.

**Pre-Shearing** means the placing of a single row of closely-spaced lightly-loaded holes along the rock excavation limits as specified in the Contract Documents that are fired simultaneously before and independently of the main excavation blast. Pre-shearing is sometimes referred to as pre-splitting.

**Reclaimed Asphalt Pavement (RAP)** means RAP as defined in OPSS 1001.

**Reclaimed Concrete Material (RCM)** means RCM as defined in OPSS 1001.

**Roadside Ditch** means a ditch with one of its slopes coincident with the road frontslope.

**Rock** means natural beds or massive fragments of the hard, stable, cemented part of the earth's crust, either igneous, metamorphic, or sedimentary in origin that may or may not be weathered and includes boulders having a volume of 1 m<sup>3</sup> or greater.

**Rock Face** means the uniform, relatively planar, maintenance-free, vertical or near vertical rock surface between the top of the existing rock surface and the designated rock or ditch grade line that is generally characterized by noticeable drill hole traces and a minimum of blast-induced fractures beyond the rock excavation limits.

**Rock Surplus** means the rock excavation original tender quantity multiplied by the bulking factor, plus the volume of rock material excavated from all other items as specified in the Contract Documents, minus the rock embankment original tender quantity, minus shatter. Rock overbreak and rock materials resulting from scaling are specifically excluded.

**Scaling** means the removal of loose, broken, or overhanging rock fragments from an existing rock surface or the removal of loose, broken, or overhanging rock fragments from a rock face that remain in place after the rock has been blasted and mucked.

**Shale** means a fine-grained, low strength, sedimentary rock that undergoes rapid deterioration on exposure.

**Shatter** means fractured rock broken by the use of explosives or mechanical means and left in place.

**Sideslope** means the slope in a fill between the edge of shoulder and the point where the slope intersects original ground.

**Spall** means a rock fragment, chip, or splinter from a rock surface created by weathering, stress relief, blasting, or a combination thereof.

**Stripping** means the excavation of the upper layer of soil, that is predominantly organic, too soft, or wet and otherwise unsuitable for the construction of embankments that is done prior to and usually independent of earth excavation or the placement of fill materials or both.

**Tolerance** means a construction working tolerance only, that is considered to be:

a) Minus when it is:

- i. narrower than the Contract standard when pertaining to horizontal dimensions as measured from centreline, or
- ii. lower in elevation than the Contract standard when pertaining to vertical dimensions.

b) Plus when it is:

- i. wider than the Contract standard when pertaining to horizontal dimensions as measured from centreline, or
- ii. higher in elevation than the Contract standard when pertaining to vertical dimensions.

**Wall Control Blasting** means a blasting method using carefully spaced and aligned drill holes intended to produce a relatively flat, maintenance-free, rock surface or rock face as specified in the Contract Documents. Wall control blasting techniques are cushion blasting, line drilling, and pre-shearing.

## **206.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **206.04.01 Submission Requirements**

#### **206.04.01.01 Rock Material Management Plan (RMMP)**

When a RMMP is specified in the Contract Documents, for each construction stage, the following information shall be submitted to the Contract Administrator a minimum of 5 Business Days prior to commencement of the work for rock excavation or rock embankment:

- a) A plan for rock excavation corresponding to the station intervals as specified in the Contract Documents. The plan shall identify the volume in cubic metres of the following:
  - i. In-situ rock prior to blasting with shatter quantity shown separately.
  - ii. Excavated rock available calculated by applying the bulking factor to the quantity of in-situ rock prior to blasting, less the quantity of shatter.
  - iii. Excavated rock to be placed in rock embankment.
  - iv. Excavated rock within the Contract limits to be processed into granular material or other aggregates required in the Contract Documents.
  - v. Excavated rock to be used for other purposes in completing the Work, such as rock protection, rip rap, or river stone and descriptions and locations of that Work.
  - vi. Excavated rock not incorporated into the Work and the locations and uses of that material.
- b) A plan for the construction of rock embankments that identifies each location and volume in cubic metres where the material is going to be supplied to the corresponding station intervals as specified in the Contract Documents.
- c) The locations and volume in cubic metres where rock materials are to be obtained.
- d) The location and volume in cubic metres for each source when additional rock or granular material or both are required to complete the Work.
- e) The amount of rock surplus, if any, during the applicable construction stage.

The Contractor shall be solely responsible for the assumptions and the reasonableness of the RMMP.

In addition, an updated RMMP shall be submitted to the Contract Administrator, on a monthly basis, which shall include an ongoing tabulation of all rock materials that have been removed by the Contractor from the rock excavation or not incorporated in embankments, shown as a cumulative reduction in rock surplus.

#### **206.04.01.02 Trial Section for Modified Layer Compaction Method**

If the Contractor requests to use the modified layer compaction method, as specified in the Modified Layer Compaction Method clause, a detailed plan shall then be submitted in writing to the Contract Administrator a minimum of 48 hours prior to commencing any work on the required trial section. The plan shall include full details of the placing of material and its compaction, including layer thickness; number and type of compaction units and number of passes.

## **206.06 EQUIPMENT**

### **206.06.01 Tractor Bulldozer - Crawler Type for Rock Embankment Construction**

Tractor bulldozer, crawler type for rock embankment construction as specified in the Rock Embankments, General clause shall have a minimum net flywheel power of 200 kW.

**206.06.02                      Rollers for Shale Embankment Construction**

Pad foot drum roller required for the construction of shale embankments shall weigh a minimum of 18 tonnes and vibratory steel drum or pneumatic-tired rollers shall weigh a minimum of 9 tonnes.

**206.06.03                      Nuclear Moisture and Density Gauge**

Nuclear moisture and density gauges shall meet the requirements of the Nuclear Moisture and Density Gauge subsection of OPSS 501.

**206.06.04                      Hydraulic Excavator - Crawler Mounted for Rock Embankment Construction**

Hydraulic excavator, crawler mounted for rock embankment construction as specified in the Rock Embankments, General clause shall have a minimum operating weight of 32,000 kg.

**206.07                            CONSTRUCTION**

**206.07.01                      General**

**206.07.01.01                 Removal of Ice, Snow, and Frozen Ground**

The Contractor shall remove and dispose of all ice, snow, and frozen material from all earth, rock, or granular surfaces prior to placing fill and from all earth, rock, or granular materials being used for backfill, embankments, or any other construction purposes.

**206.07.01.02                 Compaction**

Earth and granular materials shall be compacted according to OPSS 501.

For compaction purposes, reclaimed asphalt pavement (RAP) or reclaimed concrete material (RCM) or both shall be treated as earth or rock respectively when such material is included in an earth embankment or a rock embankment.

**206.07.01.03                 Earth Borrow**

When earth borrow is specified in the Contract Documents, it shall be according to OPSS 212.

**206.07.01.04                 Tolerances - General**

In the event of a conflict between meeting horizontal grading tolerances and meeting vertical grading tolerances, the vertical grading tolerances shall take precedence.

**206.07.01.04.01             Tolerances for Earth**

Upon completion, all earth grade surfaces, excluding swamp excavations, shall be shaped to the grades and cross-sections as specified in the Contract Documents within the following tolerances:

a) Vertical grading tolerances for the finished earth subgrade within the limit of the roadway:

- + 30 mm
- 30 mm

b) Horizontal grading tolerances for the vertical faces of excavations to be backfilled:

+ 100 mm  
- 0 mm

c) Horizontal grading tolerances for ditch slopes, excluding roadside ditches:

+ 300 mm  
- 0 mm

Sideslopes beyond the plus tolerance may be accepted by the Contract Administrator when they are not detrimental to the work.

d) Vertical grading tolerances for all ditching in earth:

+ 30 mm  
- 30 mm

e) Horizontal grading tolerances for the backslopes in earth cut sections:

+ 300 mm  
- 300 mm

Backslopes beyond the plus tolerance may be accepted by the Contract Administrator when they are not detrimental to the work.

f) Horizontal grading tolerances for each sideslope in earth embankment construction:

+ 300 mm  
- 0 mm

g) Horizontal grading tolerances for roadside ditch frontslopes in earth cut sections:

+ 30 mm  
- 0 mm

Irrespective of compliance with the above tolerances, the completed slopes shall present a uniform appearance.

#### **206.07.01.04.02 Tolerances for Rock**

Completed rock grade surfaces shall be shaped to the grades and cross-sections as specified in the Contract Documents within the following tolerances:

a) Vertical grading tolerances for the finished rock subgrade within the limits of the roadway:

For cut sections:

+ 30 mm  
- 100 mm

For fill sections:

+ 30 mm  
- 75 mm

Excavation below the minus tolerances may be accepted by the Contract Administrator when it is not detrimental to the work and is brought up to grade as specified in the Rock Excavation, Grading clause.

b) Horizontal grading tolerances for vertical rock face cut limits:

+ 0 mm  
- 300 mm

Final faces beyond the plus tolerance may be accepted by the Contract Administrator when they are not detrimental to the work.

c) Horizontal grading tolerances for sloped rock face cut limits:

+ 300 mm  
- 300 mm

d) Horizontal grading tolerances for ditch slopes, excluding roadside ditches:

+ 300 mm  
- 0 mm

Excavation beyond the plus tolerance may be accepted by the Contract Administrator when the Owner deems it is not detrimental to the work or contribute to additional rock surplus.

e) Vertical grading tolerances for all ditching in rock cuts:

+ 30 mm  
- 30 mm

Excavation below the minus tolerance may be accepted by the Contract Administrator when it is not detrimental to the work.

f) Horizontal grading tolerances at the top of each sideslope of rock embankment construction:

+ 300 mm  
- 0 mm

## **206.07.02                      Drainage**

Excavation operations shall be performed in a manner to avoid water saturation of embankment material and roadway foundation material and to avoid leaving undrained pockets in excavations by providing effective drainage during all stages of the work.

In excavations below subgrade and in stripping operations when provision for surface drainage is impractical, backfill materials shall be placed as soon as possible following the excavation work.

Ditching required to provide for drainage of an embankment shall be completed in advance of the embankment construction. Ditches in roadway cuts shall be constructed as soon as possible to provide drainage from the cuts. Ditches located above and beyond roadway cuts shall be constructed prior to excavating adjacent cuts. When pipe subdrains are required in the bases of roadway cuts, such work shall be carried out at the time that the roadside ditches are being constructed.

**206.07.03                      Excavation and Grading**

**206.07.03.01                Earth Excavation - Grading**

**206.07.03.01.01          General**

The work shall include excavating, hauling, handling and placing, shaping, compacting, trimming of earth material, applying temporary cover, and the management of excavated and excess materials as specified in the Contract Documents.

The work shall also include the excavation and removal of pipes and culverts smaller than 200 mm in diameter and expanded polystyrene insulation when located within the limits of the earth excavation, grading work.

Suitable and non-excess earth material excavated from roadway cuts, ditching, and other associated sites shall be used in earth grading and embankment construction, unless otherwise specified in the Contract Documents.

**206.07.03.01.02          Stripping**

Except when swamp treatment is required, the original ground shall be stripped at the locations and to the depths specified elsewhere in the Contract Documents.

Material required for topsoil re-use shall be stockpiled according to OPSS 802 and as specified in the Contract Documents. Other material obtained from stripping shall be managed as specified in the Management of Excavated Materials clause.

**206.07.03.01.03          Excavation Below Subgrade**

Unsuitable materials, other than material excavated from swamps, shall be removed below the subgrade to the lengths, widths, and depths as specified in the Contract Documents. The resulting excavation shall be backfilled with material acceptable to the Contract Administrator and compacted according to OPSS 501.

**206.07.03.01.04          Swamp Excavation**

Swamp excavation shall be according to OPSS 209.

**206.07.03.01.05          Backfilling of Overexcavated Areas**

When overexcavation occurs, the overexcavated area shall be backfilled with granular material according to OPSS 1010 and compacted according to OPSS 501 at no additional cost the Owner. With the exception of frontslopes and when boulders are encountered in the excavated slopes, backfilling shall not be permitted to obtain the required slopes for excavations.

When boulders are encountered in the excavated slopes, the boulders shall be removed at the direction of the Contract Administrator and the resulting cavity or cavities shall be backfilled with granular material according to OPSS 1010 and compacted according to OPSS 501.

**206.07.03.02                Rock Excavation - General**

Except where shatter is required, drilling shall not be performed outside of or extend beyond the design excavation limits as specified in the Contract Documents.

The use of explosives for rock excavation shall be as specified in the Contract Documents.

All excavated rock, including rock materials resulting from overbreak and scaling, except the quantity of rock surplus, shall be placed in embankments.

Any excavated rock remaining after constructing the embankments shall be managed as specified in the Management of Excavated Materials clause.

#### **206.07.03.02.01 Rock Excavation - Grading**

The work shall include drilling and blasting to obtain the required rock excavation and shatter, mucking, and bringing to grade any overexcavation. Hauling shall only be part of the work when the excavated material is part of the rock surplus or is in excess of the rock embankment requirements.

When rock is to be excavated, all overlying stumps, roots, and vegetation shall be managed as excess material as specified in the Contract Documents. When earth overlies the rock to be excavated, the earth shall be removed. This work shall be performed sufficiently in advance of any blasting or rock excavation operations to allow rock cross-sections to be taken.

Scaling shall be carried out during mucking. All rock fragments or boulders either within or outside the excavated areas that are likely to slide or roll down rock cuts or are otherwise deemed to be unstable by the Contract Administrator shall be removed. Cut ditches shall be excavated at the same time as the main excavation.

Overexcavation in rock cuts shall be brought to grade within the specified tolerances with rock shatter or other approved material at no additional cost to the Owner.

Rock scaling and the removing of all overbreak and scaled materials shall be included in the rock excavation, grading item, unless a rock face item is included in the Contract Documents.

#### **206.07.03.02.01.01 Shale**

Shale shall be excavated using methods appropriate for the site conditions. Side slopes in shale shall be as specified in the Contract Documents. Rock face and subgrade shatter are not required in shale.

#### **206.07.03.02.02 Rock Face**

The work shall include drilling and blasting using one or more wall control blasting techniques to produce the rock face required in the Contract Documents and all associated scaling, mucking, hauling and management of all overbreak and scaled rock as specified in the Management of Excavated Materials clause.

The Contractor shall decide the required spacing, diameter, and loading of all drill holes for wall control blasting in order to ensure a uniform shear face between the holes and to meet the tolerance requirements stated in the Tolerances for Rock clause for rock face. In no case shall the diameter and spacing of these holes be more than 100 mm and 0.75 m centre-to-centre, respectively,

The Contractor shall also decide the required spacing, diameter, and loading of the adjacent line of production drill holes located inside the controlled blasting limits in order to ensure that wall control blasting is able to produce the required rock face.

However, in no case shall any portion of a production drill hole be within 0.75 m of the line formed by the drill holes for wall control blasting.



### **206.07.03.03 Excavation for Widening**

Excavation that is adjacent to the travelled portion of the roadway shall at no time be in advance of the backfilling operation by a distance greater than the limits as specified in the Contract Documents. Any such excavation shall be backfilled and compacted with material as specified in the Contract Documents, prior to closing down operations each day.

### **206.07.03.04 Excavation for Pavement Widening**

The work shall include excavating a trench adjacent to the existing pavement to the widths and depths as specified in the Contract Documents. Excavated material shall be spread on the adjacent shoulders and slopes.

### **206.07.03.05 Management of Excavated Materials**

Excavated materials shall be used within the Contract limits as specified in the Contract Documents.

When the Contract Administrator has deemed that the Contractor's sequence of operations, inadequate drainage measures, or handling processes or all have caused earth materials that were identified in the Contract Documents as being suitable for embankment or other construction purposes to become unsuitable for such purposes then, at no additional cost to the Owner, the Contractor shall either condition that material until it is suitable or manage it as excess material as specified in the Contract Documents and, if necessary, replace it with an equivalent volume of earth borrow. When the Contractor's operations have caused the material to become unsuitable due to excessive moisture content, conditioning may then involve re-working the material as necessary or spreading out the material in layers or both so that the material is thin enough to allow it to sufficiently dry out.

Quantities of unsuitable earth as specified in the Contract Documents and deemed suitable for use as earth fill by the Contract Administrator at the time of excavation shall be used to offset borrow quantities.

Rock excavated from within the right-of-way (ROW) may be used for aggregate production, in accordance with the RMMP.

Earth or rock that is surplus to embankment requirements may be placed adjacent to the embankments by widening embankments, flattening side slopes, or constructing Berms if optional cross sections or locations or both have been specified for such material in the Contract Documents or as requested by the Contractor and agreed to, in writing, by the Contract Administrator.

Surplus material may only be used within the Contract limits with the written consent of the Contract Administrator.

Surplus materials that cannot be accommodated as above and unsuitable materials shall be managed as excess material as specified in the Contract Documents.

### **206.07.03.06 Provision for Temporary Cover**

Cover used in temporary applications shall be applied according to OPSS 804 to areas as specified in the Contract Documents.

### **206.07.04 Embankments**

Only materials that are specified in the Contract Documents for use in embankments shall be used, unless approved by the Contract Administrator, in writing, prior to placement.

Materials shall not be placed over either frozen earth or ice surfaces. Ice, frozen earth, or other unsuitable materials shall not be incorporated into embankments.

RAP materials used in embankments shall be surplus to the recycling requirements of the Contract.

The Contractor shall notify the Contract Administrator, in writing, when an embankment has been completed to the dimensions that are as specified in the Contract Documents, at least 3 Business Days prior to the Contractor placing any topsoil or any other material on the embankment slopes.

#### **206.07.04.01 Earth Embankments**

##### **206.07.04.01.01 General**

Material for earth embankments shall be deposited and spread in uniform layers for the full width of the embankment, except as otherwise permitted for berms. Each layer shall be compacted prior to placing the succeeding layer. The lower portion of side hill or sloping sections shall be similarly constructed in layers and compacted until the full width surface of the specified cross-section is obtained. The embankment shall be completed thereafter with full width layers or as staged construction allows.

The construction of a core through the embankment and the subsequent completion of the embankment are prohibited, except when core construction is permitted in swamps according to OPSS 209.

Boulders, cobbles, and fragments of rock, RAP, and RCM over 150 mm in their maximum dimension shall not be placed within 300 mm of the surface of the earth grade.

Boulders, cobbles, and fragments of rock, RAP, and RCM up to 0.5 m<sup>3</sup> may be incorporated into an earth embankment provided:

- a) They are placed only in the bottom layer of the embankment.
- b) The maximum dimension of the largest particle shall not exceed 800 mm.
- c) They are not located within 300 mm of the final embankment side slopes.
- d) They are not located within 1.0 m of the surface of the earth grade.

Topsoil placed on earth embankments shall be according to OPSS 802.

Berms may be constructed separately, but shall be completed prior to building the road embankment to a higher level than the berm.

Any excavation necessary for establishing compaction results throughout any embankment or any trial areas such as the one described in the Modified Layer Compaction Method clause shall be done by hand and the excavated areas shall be backfilled with the same material or material otherwise acceptable to the Contract Administrator and properly re-compacted by the Contractor.

##### **206.07.04.01.02 Layer Compaction Method**

Earth embankments shall be built using the layer compaction method, unless otherwise specified in the Contract Documents or the requirements specified in the Modified Layer Compaction Method clause have been met.

In the layer compaction method, the embankment material shall be spread out in uniform full width layers not more than 300 mm in depth prior to compaction. Each layer shall be shaped and compacted to the line and cross-section as specified in the Contract Documents prior to the succeeding layer being placed.

All boulders, cobbles, fragments of rock, RAP, and RCM shall have a maximum vertical dimension after placement, not greater than the fully compacted layer depth.

When the ground cannot support construction equipment using this method then, at the discretion of the Contract Administrator, the first layer may be increased in thickness as specified in the Modified Layer Compaction Method clause.

#### **206.07.04.01.03 Modified Layer Compaction Method**

When it is impractical to use the layer compaction method, the modified layer compaction method may be used, at the discretion of and with the written consent of the Contract Administrator.

In this case, the embankment material shall be spread out in uniform full width layers not more than 600 mm in depth prior to compaction. Each layer shall be shaped and compacted to the line and cross-section specified prior to the succeeding layer being placed.

All boulders, cobbles, and fragments of rock shall have a maximum vertical dimension when placed not exceeding the modified layer depth. All RAP and RCM shall have a maximum vertical dimension after placement not exceeding 300 mm.

Prior to placing any material, the Contractor shall provide proof to the Contract Administrator of the ability of the proposed method to achieve the specified density by means of a trial section consisting of a single uniform lift covering a minimum area of 400 m<sup>2</sup> as specified in the Trial Section for Modified Layer Compaction Method clause. The location and extent of the trial section shall be acceptable to the Contract Administrator.

Prior to the construction of the trial section, the maximum dry density (MDD) of the material to be compacted shall be determined according to LS-706 from a minimum of 3 independent samples of the material.

Acceptance of the trial section shall be based on compaction testing within the trial section lift. For testing within the lift, the trial section shall be a single lot with 4 sublots of equal area. At a random location within each subplot, a level surface shall be prepared at a depth that permits the probe of a nuclear moisture and density gauge to extend to the bottom of the lift. Field wet density and moisture content shall be determined at each random location using the gauge and the dry density value calculated for each subplot.

If the quality index for the lot, calculated according to the Quality Index clause of OPSS 501, is equal to or greater than 1.47, the trial section shall be accepted. If the quality index for the lot is less than 1.47, the method of construction of the trial section shall not be accepted. The target density for the purpose of the quality index calculation shall be the average of the 3 MDD values determined according to LS-706.

If the trial section has been accepted, field wet density and moisture content testing shall be carried out at 10 random locations on the trial section surface using a nuclear moisture and density gauge. The average dry density from the 10 locations shall be calculated and used as the target density for acceptance, according to OPSS 501, for further placement of the material by the modified layer compaction method.

The same procedure used for the construction of the accepted trial section, including compaction equipment, vibration characteristics, and number of passes, shall be used for the further placement and compaction of the same material by the modified layer compaction method.

A new trial section shall be required for the material when one or more of the following apply:

- a) A new target density is required according to the Target Density clause of OPSS 501.
- b) The Contractor wants to change the accepted modified layer compaction method procedure.
- c) An accepted modified layer compaction method procedure is no longer producing the required degree of compaction.

When requested by the Contract Administrator, compacted material shall be removed to verify the thickness and/or complete compaction testing on a levelled surface within any compacted lift.

All excavation, backfilling, and re-compaction necessary for thickness verification and compaction testing within the trial section lift and as requested by the Contract Administrator at other locations shall be completed to the satisfaction of the Contract Administrator at no additional cost.

#### **206.07.04.02            Rock Embankments**

##### **206.07.04.02.01        General**

The work shall include hauling, placement, and compaction of excavated rock.

Excavated rock used to construct rock embankments shall be obtained from within the Contract limits. If there is insufficient material to complete the rock embankments, the additional material shall then be provided and paid for under the rock borrow item.

All rock from other items as specified in Contract Documents shall be used to construct rock embankments.

Rock embankments shall be constructed by placing embankment materials full width in successive uniform layers.

For rock embankments, other than shale, the layers shall not exceed 1.5 m in thickness prior to compaction. The material in each layer shall be fully compacted before the succeeding layer is placed. Each rock fill layer shall be compacted with a tractor bulldozer, crawler type, as specified in the Tractor Bulldozer - Crawler Type for Rock Embankment Construction subsection. In confined areas or in any other areas where the Contract Administrator agrees that a tractor bulldozer, crawler type, cannot be reasonably used, then each rock fill layer may be compacted using a hydraulic excavator, crawler mounted, as specified in the Hydraulic Excavator - Crawler Mounted for Rock Embankment Construction subsection. The minimum number of complete passes shall be six and the maximum number of passes shall be eight for either type of equipment. A complete pass shall be defined as 100% coverage of the layer surface. The maximum speed of the equipment during each pass shall be 3.2 km/h.

For all rock embankments, materials shall be placed in their final position by blading when using a tractor bulldozer, crawler type for or by raking and chinking when using a hydraulic excavator, crawler mounted or a combination of both types of equipment, providing that the total number of complete passes over the same area specified in the paragraph given above is achieved. End dumping or depositing of rock over the end of any layer by hauling equipment is not permitted, except as otherwise noted below. Each layer shall be levelled in place and compacted to minimize voids and bridging of large rock fragments within the embankment.

Rock fragments exceeding a maximum of 1.0 m in any dimension shall be well distributed throughout the embankment. Rock fragments up to a maximum of 3.0 m in any dimension may be incorporated into the embankment, provided that the rock fragments are less than two-thirds the remaining embankment height when measured from the bottom of the oversized rock fragment at the point of placement to the top of the rock embankment, and shall be sufficiently spaced to allow free access of the specified equipment to compact the intervening fill.

Placement and compaction in layers is not required when rock is placed under water. In this case, end dumping may be used. However, end dumping shall only be used to an elevation of 1.0 m above the water level that is present at the time of placement. After that, the rock embankment shall be constructed using the equipment and method specified in the paragraphs above. The materials shall be well distributed to form a solid embankment constructed to full width as the work progresses or as staged construction allows.

When a rock embankment is constructed in a wet area such as swamps with full, partial, or no excavation, the direction of the rock placement shall be so that mud waves generated by the rock placement are able to move away from the embankment. Mud waves shall be displaced or removed to prevent their entrapment below or within the embankment.

End dumping from the top of the embankments may also be carried out at locations as specified in the Contract Documents when narrow and relatively shallow widening of an existing embankment is required for the shoulder portion of the highway.

The top surface of the embankment shall be chinked with rock fragments and spalls to form the subgrade prior to the placement of the roadway subbase in order to minimize voids and prevent migration of the subbase material into the rock fill.

Care shall be taken to avoid large boulders and rock fragments protruding above the average embankment surface within a distance of 3.0 m beyond the edge of shoulder.

With the written approval of the Contract Administrator, dumping of surplus rock over the sides of rock embankments by the Contractor is permitted as follows:

- a) After the rock embankments have been completed to the grades and tolerances specified in the Contract Documents and all such measurements have been verified by the Contract Administrator.
- b) Only in areas that do not affect features that are located within the right-of-way (e.g., ditches, culverts, and signs) or the right-of-way limits and shall not detrimentally affect stability or drainage or cause other potentially negative impacts.

In other areas at the discretion of the Contract Administrator.

#### **206.07.04.02.02            Shale Embankments**

Shale embankment materials shall be deposited and spread in uniform layers for the full width of the embankment. Layers shall not exceed 450 mm in thickness prior to compaction. When a harder, more durable rock (e.g., limestone) is present as an integral part of a shale formation, no pieces shall be placed in the embankment that after placement are greater than 150 mm measured vertically or greater than 600 mm measured parallel to the embankment layers, respectively.

Compaction of each layer shall be in two stages using equipment specified in the Rollers for Shale Embankment Construction subsection. In the first stage, a minimum of 2 passes shall be made with a static sheepsfoot, packall, padfoot, or tamping foot type roller. In the second stage, a minimum of 2 passes shall be made with a vibratory steel drum or pneumatic-tired roller. The maximum speed of rollers shall not exceed 5 km/hr.

#### **206.07.05                    Rock Backfill to Structure**

When rock backfill to structures is specified, the rock backfill shall only be comprised of rock fragments with maximum dimensions no larger than 250 mm and free of all debris, earth, topsoil, wood, chemical, or other contamination.

Rock backfill shall be placed in a manner that the structure is not damaged. Dumping of rock backfill against a structure shall not be permitted.

**206.07.06                      Quality Control**

**206.07.06.01                  Grade Checks**

The Contractor shall be responsible for carrying out all quality control (QC) grade checks to ensure that horizontal and vertical grading tolerances are met.

A competent surveyor shall carry out grade checks on all finished earth and rock grade surfaces. QC of earth and rock grade surfaces shall be based on horizontal and vertical grading tolerances as specified in the Tolerances for Earth and Tolerances for Rock clauses, respectively. The grade shall be certified at the stations and offsets shown in the grading templates or where grading templates are not available, at the frequency requirements specified for the layout elsewhere in the Contract Documents.

**206.07.06.01.01              Submission of Grade Checks**

The Contractor shall submit all grade checks relating to horizontal and vertical grading tolerances, including all non-compliances, to the Contract Administrator within 2 Business Days following completion of the grade.

When a digital terrain model is available, the Contractor has the option to provide the grade checks in the same format accompanied with a signed cover letter certifying that the components of the work indicated on the digital terrain model have been correctly constructed to the specified line and grade tolerances.

Alternatively when grading templates are available, the Contractor shall sign and certify on the grading template that the components of the work indicated on that template have been correctly constructed to the specified line and grade tolerances.

If a digital terrain model or template is not available, then the Contractor shall complete, sign, and submit the attached form OPSF 206-1 to the Contract Administrator.

**206.07.06.02                  Compaction Quality Control**

The Contractor shall use Method B according to OPSS 501 for quality control of compaction.

**206.07.07                      Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**206.08                          QUALITY ASSURANCE**

**206.08.01                      Grade Checks**

The Owner may conduct random QA grade checks to verify horizontal and vertical grading tolerances.

Provided that the Owner's grade checks conform to those submitted by the Contractor, no action shall be taken. If discrepancies between QA and QC grade checks occur, the Owner may then conduct additional QA grade checks at the Owner's discretion.

If the finished grade or cross-section is found to be outside the specification limits specified in the Tolerances - General clause, then:

- a) The Contract Administrator shall notify the Contractor.
- b) The Contractor shall then bring the earth or rock grade surface to within the specified tolerances for grade, at no additional cost to the Owner.

**206.09 MEASUREMENT FOR PAYMENT**

**206.09.01 Actual Measurement**

**206.09.01.01 Earth Excavation, Grading**

Measurement for earth excavation, grading, shall be the in-place volume of earth in cubic metres computed from field measurements of cross-sections taken both prior to grubbing and upon completion of the work.

When benching is required to key-in new fills into existing slopes, the quantity of materials that are excavated as part of that operation shall not be included in the measurement for payment.

**206.09.01.01.01 Overbuilding, Earth**

When the Contract requires earth borrow, the quantity of material placed beyond the earth grading tolerances shall be deducted from the measured quantity of earth borrow on a cubic metre for cubic metre basis, with no correction for changes in the density of the material.

**206.09.01.02 Excavation for Pavement Widening**

Measurement of excavation for pavement widening shall be the horizontal length in metres along each edge of the existing pavement when widening is specified in the Contract Documents.

**206.09.01.03 Rock Excavation, Grading**

**206.09.01.03.01 General**

Measurement of rock excavation, grading, shall be the in-place volume in cubic metres computed from field measurements of cross-sections bounded by the original rock line after the earth overburden has been removed and the theoretical rock face and the bottom excavation limits designated in the Contract Documents. Where shatter is specified, the bottom of the cut shall be 300 mm below the designated rock grade.

The quantity of rock excavation shall also include:

- a) All shatter that is specified in the Contract Documents.
- b) Any rock that is excavated beyond the limits that are as specified in the Contract Documents at the Contract Administrator's written instructions.

**206.09.01.03.02 Overbuilding, Rock**

Where the Contract requires borrow, the quantity of material placed beyond the rock grading tolerance at the top of subgrade and beyond the angle of repose for rock fills, below the subgrade, shall be deducted from the measured quantity of borrow on a cubic metre for cubic metre basis, with no correction for changes in density of the material.

**206.09.01.03.03 Boulders**

Measurement of each boulder classified as rock shall be by volume in cubic metres computed on the basis of the product of the actual rock measurement of the 3 maximum rectilinear dimensions in metres of the boulder.

**206.09.01.04 Rock Face**

Measurement of rock face shall be by area of the rock face in square metres.

**206.09.01.05                      Rock Embankment**

Measurement of rock embankment shall be by volume in cubic metres of rock embankments. Adjustments to the Plan Quantity shall be limited to those supported with topographic survey information.

**206.09.02                      Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**206.10                      BASIS OF PAYMENT**

**206.10.01                      Earth Excavation, Grading - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

Payment for earth grade checks, including provision of all labour, Equipment, and Material to conduct quality control testing shall be included in the Contract price as part of the work of earth excavation, grading.

**206.10.02                      Excavation for Pavement Widening - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract Administrator directs that material excavated under this item is to be handled other than as specified in the Excavation for Pavement Widening clause, then such material shall be managed in accordance with the Contract Documents and treated as a Change in the Work.

Material used to backfill the excavation shall be paid for at the Contract price for the tender item of the type of material used.

**206.10.03                      Rock Excavation, Grading - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When a rock face item is not included in the Contract, rock scaling and the removing of all overbreak and scaled materials shall be included in the rock excavation, grading item.

When a rock embankment item is not included in the Contract, the work of rock embankment shall be included in the rock excavation, grading item.

When excavated rock is to be used for any other Contract item work (e.g., rock embankment, granular materials, or rip-rap), the hauling costs are deemed to be included in payment for the work associated with the appropriate tender item. However, when excavated rock is not to be used for any other Contract item work, the hauling costs are then deemed to be included in payment for the work under the rock excavation, grading item.

Payment for rock grade checks, including provision of all labour, Equipment, and Material to conduct quality control testing, shall be included in the Contract price as part of the work of rock excavation, grading.



When drilling, blasting, and mucking are required as a part of the work for this tender item, the following progress payments shall be made:

- a) 33% of the progress volume for drilling.
- b) 33% of the progress volume for blasting.

**206.10.04                      Rock Face - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

On completion of drilling and blasting, a progress payment of 50% of this tender item shall be made.

On completion of mucking, a progress payment of an additional 25% of this tender item shall be made.

When the Contract does not contain a separate tender item for rock face, the Contract price for rock excavation, grading, shall include full compensation for all labour, Equipment, and Material to do the work of rock face.

**206.10.05                      Rock Embankment - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract does not contain a separate tender item for rock embankment, the Contract price for rock excavation, grading shall include full compensation for all labour, Equipment, and Material to do the work of rock embankment.

**206.10.06                      Backfill for Overexcavation**

Payment shall not be made for backfill of any overexcavation in excess of the specified tolerances.

**206.10.07                      Backfill for Subexcavation**

Material used to backfill subexcavations and transition or grade point treatments shall be paid for at the Contract price for the tender item of material used.

**206.10.08                      Rock Borrow**

When the Contract does not contain sufficient rock within the Contract limits and the Contract does not contain a rock embankment item, rock borrow shall be paid according to OPSS 212.



## **Appendix 206-A, April 2019 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

Consider using OPSS.PROV 206 when rock excavation volumes is in excess of 10,000m<sup>3</sup>.

The designer should specify the following in the Contract Documents:

- Locations for use of excavated material. (206.07.03.05)
- Areas requiring temporary cover. (206.07.03.06)
- Location and extent of unsuitable material below subgrade to be removed. (206.07.03.01.03)
- The stripping limits. (206.07.03.01.02)
- The maximum limit of open excavation allowed adjacent to the travelled roadway. (206.07.03.03)
- The widths and depths when excavation is required adjacent to the travelled roadway. (206.07.03.04)

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- Rock material management plan. (206.04.01.01)
- Borrow requirements. (206.07.01.03)
- Rock face item. (206.07.03.02.02)
- Rock embankment item. (206.10.05)
- Where the Modified Layer Compaction Method may be used. (206.07.04.01.03)
- Location of where end dumping material is allowed. (206.07.04.02.01)

The designer should be aware that in estimating fill quantities, where displacement may be anticipated, an allowance should be made for losses into bottom of fills in material due to displacement.

Consideration should be given to the use of trial blast over a limited extent to ensure that the method spacing and diameter wall control blast holes are properly selected to achieve an acceptable rock face for the given rock condition.

On reconstruction projects, areas of subgrade shatter, rock fill, and previously blasted rock to be removed should be clearly defined in terms of location, depth, etc.

When a rock embankment item is not included in the Contract, the designer should include a rock borrow item if there is insufficient rock within the Contract limits.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

## Appendix 206-A

### Related Ontario Provincial Standard Drawings

OPSD 200.010	Earth/Shale Grading, Undivided Rural
OPSD 200.020	Earth/Shale Grading, Divided Rural
OPSD 201.010	Rock Grading, Undivided Rural
OPSD 201.020	Rock Grading, Divided Rural
OPSD 202.010	Slope Flattening Using Excess Material on Earth or Rock Embankment
OPSD 202.020	Drainage Gap for Slope Flattening on Rock or Granular Embankment
OPSD 202.030	Embankment Widening for Guide Rail End Treatments and Transitions
OPSD 203.010	Embankments Over Swamp, New Construction
OPSD 203.020	Embankments Over Swamp, Existing Slope Excavated to 1H:1V
OPSD 203.030	Embankments Over Swamp, Existing Slopes Maintained
OPSD 203.040	Embankments Over Swamp at Pipe Culverts $\leq 1500\text{mm}$
OPSD 204.010	Boulder Treatment, Cut Sections - Subgrade
OPSD 205.010	Transition Treatment, Earth Cut to Earth Fill
OPSD 205.020	Transition Treatment, Rock Cut to Rock Fill
OPSD 205.030	Transition Treatment, Rock Cut to Earth Fill
OPSD 205.040	Transition Treatment, Earth Fill to Rock Fill and Earth Fill to Granular Fill
OPSD 205.050	Transition Treatment, Rock Cut to Earth Cut
OPSD 205.060	Frost Heave Treatment
OPSD 208.010	Benching of Earth Slopes
OPSD 209.010	Rural Pavement Widening
OPSD 209.011	Rural Pavement Widening with Curb and Gutter
OPSD 209.020	Widening, Existing Rock Cut with Grade Raise
OPSD 300.010	Side Road Intersection, Fill
OPSD 300.020	Side Road Intersection, Cut
OPSD 301.010	Rural Entrances to Roads on Fill
OPSD 301.020	Rural Entrances to Roads in Earth Cut With Culvert Installation
OPSD 301.030	Rural Entrance, Rock Cut



**CONSTRUCTION SPECIFICATION FOR  
TRENCHING, BACKFILLING, AND COMPACTING**

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**401.01 SCOPE**

This specification covers the requirements for excavating, backfilling, and compacting trenches for the installation of pipe, end sections, and associated appurtenances.

**401.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **401.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **401.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206	Grading
OPSS 403	Rock Excavation for Pipelines, Utilities, and Associated Structures in Open Cut
OPSS 404	Support Systems
OPSS 412	Sewage Forcemain Installation in Open Cut
OPSS 441	Watermain Installation in Open Cut
OPSS 490	Site Preparation for Pipelines, Utilities, and Associated Structures
OPSS 491	Preservation, Protection, and Reconstruction of Existing Facilities
OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 501	Compacting
OPSS 510	Removal
OPSS 517	Dewatering for Excavations
OPSS 539	Temporary Protection Systems
OPSS 902	Excavating and Backfilling - Structures

### **Ontario Provincial Standard Specifications, Material**

OPSS 1010	Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
OPSS 1359	Unshrinkable Backfill

### **Provincial Statute**

O. Reg. 213/91	Construction Projects
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For the purpose of this specification, the following definitions apply:

**Associated Appurtenances** means as defined in OPSS 412 and OPSS 441.

**Backfilling** means the operation of filling the trench with bedding, cover, and backfill material or embedment and backfill material.

**Backfill Material** means fill material used above the embedment or cover material and below the lower of the subgrade or finished grade or the original ground.

**Bedding Class** means a classification system that defines the depth of the bedding material.

**Bedding Material** means material as it relates to rigid pipe, from the bottom of the trench to the bottom of the cover.

**Cover Material** means the material placed from the top of the bedding to the bottom of the backfill for rigid pipe.

**Deleterious Material** means materials from the recycling stream other than glass, ceramic, reclaimed asphalt pavement, and reclaimed concrete materials that includes but is not limited to the following: wood, clay brick, clay tile, plastic, gypsum, gypsum plaster, and wallboard.

**Embedment Material** means material as it relates to flexible pipe, from the bottom of the trench to the bottom of the backfill.

**Excavation, Earth and Rock** means the excavation classified as earth and rock according to OPSS 206.

**Extra Excavation** means all excavation ordered in writing by the Contract Administrator beyond excavation as specified in the Contract Documents.

**Flexible Pipe** means pipe that can deflect 2% or more without cracking such as polyvinyl chloride, polyethylene, or steel pipe.

**Imported Material** means material obtained from a source other than the Working Area.

**Native Material** means the material removed to form an excavation within the Working Area for return to the same or other excavation.

**Pipe** means sanitary or storm pipe sewers, watermains, forcemains, pipe culverts, and subdrains.

**Rigid Pipe** means pipe that cannot deflect more than 2% without cracking such as concrete pipe.

**Trench** means as defined in O. Reg 213/91.

**Trenching** means the earth or rock excavation required to construct a trench in which to install pipes and their associated appurtenances.

**Trench Width** means the horizontal distance between the trench walls as measured at the bedding grade.

**Unshrinkable Fill** means as defined in OPSS 1359.

**401.05 MATERIALS**

**401.05.01 Bedding Material and Embedment Material**

Bedding and embedment materials shall be one of the following, or as specified in the Contract Documents:

- a) Granular A.
- b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.
- c) Unshrinkable fill.

**401.05.02 Cover Material**

Cover material shall be one of the following, or as specified in the Contract Documents:

- a) Granular A.
- b) Granular B, Type I, II, or III, with 100% passing the 26.5 mm sieve.

**401.05.03 Granular Material**

Granular material shall be according to OPSS 1010.

**401.05.04 Backfill Material**

**401.05.04.01 General**

Backfill material shall be one of the following, or as specified in the Contract Documents:

- a) Granular A.
- b) Granular B, Type I, II, or III.
- c) Unshrinkable fill.
- d) Native material.

**401.05.04.02 Native and Imported Material**

Only native and imported material approved by the Contract Administrator shall be used. All material shall be free from frozen lumps, cinders, ashes, organic matter, rocks and boulders over 150 mm in any dimension, and other deleterious material.

**401.05.05 Unshrinkable Fill**

Unshrinkable fill shall be according to OPSS 1359.

**401.07 CONSTRUCTION**

**401.07.01 General**

Trenches shall be stable and dry, unless designated by the Contract Administrator as subaqueous Work.



**401.07.02 Site Preparation**

Site preparation shall be according to OPSS 490.

**401.07.03 Preservation and Protection of Existing Facilities**

Preservation and protection of existing facilities shall be according to OPSS 491.

**401.07.04 Removals**

Removals shall be according to OPSS 510.

**401.07.05 Dewatering**

Dewatering shall be according to OPSS 517 for placement of pipe or to OPSS 902 for placement of structures.

**401.07.06 Support Systems**

Support systems shall be according to OPSS 404.

**401.07.07 Temporary Protection Systems**

The construction of all temporary protection systems shall be according to OPSS 539. When the stability, safety, or function of an existing roadway, railway, other works, or proposed works may be impaired due to the method of operation, appropriate protection shall be provided. Protection may include sheathing, shoring, and the driving of piles, when necessary.

**401.07.08 Removal of Frozen Ground**

Written permission shall be obtained from the Contract Administrator prior to starting any excavation in frozen ground. The method used for removal of frozen ground shall not cause damage to adjacent structures or Utilities.

**401.07.09 Trenching**

Trenches shall be excavated to the lines, grades, and dimensions specified in the Contract Documents. The width of the trench at the bottom shall not exceed the width at the top.

Trenching for pipe culverts shall include the excavation for frost tapers and end sections.

No more than 15 m of trench shall be open in advance of the completed pipe system.

The Contract Administrator shall be notified immediately if the bottom of the trench appears to give an unsuitable foundation.

When installing rigid pipe, if the trench is excavated wider than the allowable width without authorization, the Contract Administrator may require the use of a stronger pipe or a higher bedding class or both.

If the trench depth is excavated beyond the limits of the required excavation without the Contract Administrator's authorization, granular material shall be placed and compacted in the trench to reinstate the required trench limits prior to backfilling the trench as specified in the Contract Documents. Alternatively, another structurally accepted design shall be provided by adjusting the limits of the excavation prior to backfilling.

Rock excavation for trenches shall be according to OPSS 403.

## **401.07.10 Backfilling and Compacting**

### **401.07.10.01 General**

Allowable deflection in diameter of flexible pipe during cover and backfill operations shall be as per manufacturer's recommendations.

Compacting of embedment, bedding, cover, and backfill materials during pipe installation shall be according to OPSS 501.

Prior to allowing the movement of any construction equipment or vehicular traffic over the buried infrastructure, the depth of backfill shall be sufficient enough to protect the buried infrastructure from damage.

### **401.07.10.02 Embedment**

Placement of embedment material shall be as described in the Bedding and Cover clauses.

### **401.07.10.03 Bedding**

Pipe bedding shall be of the class as specified in the Contract Documents.

The surface upon which the pipe is to be laid shall be true to grade and alignment.

The pipe bedding shall be shaped to the dimensions specified in the Contract Documents. When bell and spigot pipe is to be laid, recesses shall be shaped to receive the bells.

Bedding material placed in the haunches shall be compacted prior to continued placement of cover material.

Bedding material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Bedding material shall be placed on each side of the pipe and shall be completed simultaneously. At no time shall the levels on each side differ by more than the 200 mm uncompacted layer.

### **401.07.10.04 Cover**

Cover material shall be placed so that damage to or movement of the pipe is avoided.

Cover material shall be placed in uniform layers not exceeding 200 mm in thickness, loose measurement, and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Cover material shall be placed on each side of the pipe and shall be completed simultaneously. At no time shall the levels on each side differ by more than the 200 mm uncompacted layer.

### **401.07.10.05 Backfill**

Backfill material shall be placed in uniform layers not exceeding 300 mm in thickness, loose measurement, for the full width of the trench and each layer shall be compacted according to OPSS 501 before a subsequent layer is placed.

Power operated tractors or rolling equipment shall not be used for compacting until backfill material has been placed to a minimum depth of 900 mm above the crown of the pipe. Uniform layers of backfill material exceeding 300 mm in thickness may be placed with the approval of the Contract Administrator.

**401.07.11                    Extra Trenching, Backfilling, and Compacting**

Extra trenching, backfilling, and compacting shall be as described in the Trenching and Backfilling and Compacting subsections.

Unsuitable material shall be excavated and the resulting excavation shall be backfilled and compacted to obtain a suitable foundation.

**401.07.12                    Site Restoration**

Site restoration shall be according to OPSS 492.

**401.07.13                    Management of Excess Material**

Management of excess material shall be as specified in the Contract Documents.

**401.09                        MEASUREMENT FOR PAYMENT**

**401.09.01                    Actual Measurement**

**401.09.01.01                Extra Trenching, Backfilling, and Compacting**

Extra trenching, backfilling, and compacting shall be based on the volume of the extra excavation measured in cubic metres prior to installation of the pipe.

The volume of the excavation that is in addition to the limits specified in the Contract Documents shall be determined.

**401.10                        BASIS OF PAYMENT**

**401.10.01                    Trenching, Backfilling, and Compacting**

Payment at the Contract price for the appropriate tender items for the installation of pipe, end sections, and associated appurtenances, shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

Any expenses for remedial work resulting from unauthorized over-excavation of the trench width and depth shall be at no additional cost to the Owner.

When native material is deemed unsuitable for backfill for reasons other than those attributed to the Contractor's mode of operation, any extra work done to provide acceptable backfill beyond the work herein specified shall be paid for as Extra Work.

**401.10.02                    Extra Trenching, Backfilling, and Compacting - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

**401.10.03                    Rock Excavation for Trenches**

Payment for rock excavation for trenches shall be according to OPSS 403.

## **Appendix 401-A, November 2021 FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

### **Designer Action/Considerations**

The designer may consider including soil boring data, a geotechnical report, a subsurface report, or a soils report in the tender documents.

The designer may consider specifying requirements for a pre-condition survey in the Contract Documents.

The designer should specify the following in the Contract Documents:

- Extra excavation. (401.03)
- Type of embedment material. (401.05.01)
- Type of bedding material. (401.05.01)
- Type of cover material. Unshrinkable fill or native material may be a consideration in the cover (401.05.02)
- Type of backfill material. (401.05.04.01)
- Trench line, grade, and dimensions. (401.07.09)
- Pipe bedding class and dimensions. (401.07.10.03)
- Volume of the excavation that is in addition to the limits. (401.09.01.01)

For utilities, the designer should reference their respective trenching, backfilling, and compaction details.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

### **Related Ontario Provincial Standard Drawings**

OPSD 802.010	Flexible Pipe Embedment and Backfill, Earth Excavation
OPSD 802.013	Flexible Pipe Embedment and Backfill, Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.020	Flexible Pipe Arch Embedment and Backfill, Earth Excavation
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill, Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.030	Rigid Pipe Bedding, Cover and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.031	Rigid Pipe Bedding, Cover and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.032	Rigid Pipe Bedding, Cover and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.033	Rigid Pipe Bedding, Cover and Backfill, Rock Excavation
OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 802.050	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.051	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.052	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover and Backfill, Rock Excavation

OPSD 802.054 Horizontal Elliptical Rigid Pipe Bedding and Cover in Embankment, Original Ground:  
Earth or Rock  
OPSD 803.010 Backfill and Cover for Concrete Culverts  
OPSD 803.030 Frost Treatment - Pipe Culverts, Frost Penetration Line Below Bedding Grade  
OPSD 803.031 Frost Treatment - Pipe Culverts, Frost Penetration Line Between Top of Pipe and  
Bedding Grade



**CONSTRUCTION SPECIFICATION FOR  
PIPE CULVERT INSTALLATION IN OPEN CUT**

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**421.01 SCOPE**

This specification covers the requirements for the installation of pipe culverts, pipe culvert end sections, and concrete appurtenances in open cut.

**421.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **421.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **421.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standards Specifications, Construction**

OPSS 206	Grading
OPSS 401	Trenching, Backfilling, and Compacting
OPSS 404	Support Systems
OPSS 409	Closed-Circuit Television (CCTV) Inspection of Pipelines
OPSS 490	Site Preparation for Pipelines, Utilities, and Associated Structures
OPSS 491	Preservation, Protection, and Reconstruction of Existing Facilities
OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 510	Removal
OPSS 517	Dewatering of Pipeline, Utility, and Associated Structure Excavation
OPSS 539	Temporary Protection Systems
OPSS 904	Concrete Structures
OPSS 905	Steel Reinforcement for Concrete

### **Ontario Provincial Standard Specifications, Material**

OPSS 1004	Aggregates - Miscellaneous
OPSS 1205	Clay Seal
OPSS 1301	Cementing Materials
OPSS 1302	Water
OPSS 1350	Concrete - Materials and Production
OPSS 1440	Steel Reinforcement for Concrete
OPSS 1801	Corrugated Steel Pipe Products
OPSS 1820	Circular Concrete Pipe

OPSS 1840	Non-Pressure Polyethylene Plastic Pipe Products
OPSS 1841	Non-Pressure Polyvinyl Chloride (PVC) Pipe Products
OPSS 1843	Non-Pressure Polypropylene (PP) Plastic Pipe Products
OPSS 1860	Geotextiles

**ASTM International**

C 507-12 Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe

**421.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Backfilling** means the operation of filling the trench with bedding, cover, and backfill material or embedment and backfill material.

**Concrete Appurtenances** means concrete head walls, cut-off walls, stiffeners, aprons, collars, and any other concrete fixtures associated with the pipe culvert, excluding concrete bedding or concrete structures specified in the Contract Documents.

**Culvert End Section** means appurtenances attached to the ends of culverts for hydraulic, safety, or slope stability purposes.

**Excavation** means the excavation classified as earth and rock according to OPSS 206.

**Flexible Pipe** means pipe that can deflect 2% or more without cracking, such as polyvinyl chloride, polyethylene, or steel pipe.

**Pipe Class** means a pipe's physical material specification, such as load and pressure ratings, wall thickness, protective coatings, corrugation profiles, ring stiffness constants, and reinforcement.

**Pipe Culvert** means an installation designed to provide for the conveyance of surface water, pedestrians, or livestock using preformed or precast pipe sections, circular or non-circular in cross-section, laid end to end using suitable joint materials.

**Pipe Type** means a pipe's inner wall design, which can be smooth or corrugated.

**Polypropylene Plastic** means a material made with virgin polymers in which propylene is essentially the sole monomer.

**421.05 MATERIALS**

**421.05.01 Pipe Materials**

**421.05.01.01 General**

Pipe culvert size, type, and class shall be as specified in the Contract Documents.

Pipe culvert type shall be consistent throughout the length of the pipe culvert as specified in the Contract Documents.

Fittings shall be suitable for and compatible with the pipe type and class for which they will be used.



**421.05.01.02 Concrete Pipe**

Circular concrete pipe and joints shall be according to OPSS 1820.

Elliptical concrete pipe and joints shall be according to ASTM C 507.

**421.05.01.03 Corrugated Steel Pipe Products**

Corrugated steel pipe products shall be according to OPSS 1801.

**421.05.01.04 Polyethylene Pipe Products**

Polyethylene pipe products shall be according to OPSS 1840.

**421.05.01.05 Polyvinyl Chloride Pipe Products**

Polyvinyl chloride pipe products shall be according to OPSS 1841.

**421.05.01.06 Polypropylene Plastic Pipe Products**

Polypropylene plastic pipe products shall be according to OPSS 1843.

**421.05.02 Mortar**

Mortar for joints shall consist of one part Portland cement and two parts mortar sand, wetted with sufficient water to only make the mixture plastic. The mortar sand shall be according to OPSS 1004, the normal Portland cement shall be according to OPSS 1301, and the water shall be according to OPSS 1302.

**421.05.03 Clay Seal**

Clay seal material shall be according to OPSS 1205.

**421.05.04 Concrete**

Concrete for concrete appurtenances shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

**421.05.05 Steel Reinforcement**

Steel reinforcement shall be of the size and grade specified in the Contract Documents and shall be according to OPSS 1440.

**421.05.06 Geotextile**

Geotextile shall be according to OPSS 1860.

**421.07 CONSTRUCTION**

**421.07.01 Site Preparation**

Site preparation shall be according to OPSS 490.

**421.07.02                      Removals**

Removals shall be according to OPSS 510.

**421.07.03                      Preservation and Protection of Existing Facilities**

Preservation and protection of existing facilities shall be according to OPSS 491.

**421.07.04                      Protection Against Floatation**

Damage to the pipeline due to floatation shall be prevented during construction and until completion of the work.

**421.07.05                      Cold Weather Work**

All work shall be protected from freezing. Pipes and bedding material shall not be placed on frozen ground.

**421.07.06                      Transporting, Unloading, Storing, and Handling Pipe**

Manufacturer's recommendations for transporting, unloading, storing, and handling of pipe, shall be followed.

All pipes, fittings, and gaskets that are unsound or damaged shall be rejected.

**421.07.07                      Excavation**

Excavation for the placement of pipe culverts shall be according to OPSS 401.

**421.07.08                      Support Systems**

Support systems shall be according to OPSS 404.

**421.07.09                      Dewatering**

Dewatering shall be according to OPSS 517.

**421.07.10                      Protection Systems**

The construction of all protection systems shall be according to OPSS 539. When the stability, safety or function of an existing roadway, railway, other works, or proposed works may be impaired due to the method of operation, such protection as may be required shall be provided. Protection may include sheathing, shoring and driving piles, when necessary, to prevent damage to such works or proposed works.

**421.07.11                      Backfilling and Compacting**

Backfilling and compacting shall be according to OPSS 401.

**421.07.12 Pipe Installation**

**421.07.12.01 General**

If a universal dimple coupler or any other coupler does not follow the contour of the flexible pipe sections to be joined, polyethylene gaskets shall then be installed at all joints when such couplers are used. Polyethylene gaskets shall be installed symmetrically about the pipe joint, between the coupler and the pipe, and shall be of sufficient length to equal the circumference of the pipe plus a minimum overlap of 300 mm.

Pipe shall be laid within the alignment and grade tolerances specified in the Contract Documents. When bell and spigot pipe is laid, the bell end of the pipe shall be laid upgrade.

Pipe shall be kept clean and dry as work progresses. The trench shall be kept dry. A removable watertight bulkhead shall be installed at the open end of the last pipe laid whenever work is suspended.

Pipe shall not be laid until the preceding pipe joint has been completed and the pipe is carefully embedded and secured in place.

When the Owner raises or lowers the invert of a pipe culvert by up to 150 mm, it shall not constitute a Change in the Work and no adjustment shall be made to the payment. When the invert of a pipe culvert is raised or lowered by more than 150 mm, then this shall constitute a Change in the Work for the full extent of the change from the original grade.

The pipe culvert cut-end finish, end sections, and safety slope end treatments shall be as specified in the Contract Documents.

When installing gaskets, all pipe ends shall be thoroughly cleaned. For gaskets requiring field lubrication, a lubricant recommended by the pipe manufacturer shall be used.

When gaskets have been affixed, the pipe shall be handled in a way so that the gasket is not damaged, displaced, or contaminated with foreign matter. Any gasket displaced or contaminated shall be removed, cleaned, and lubricated, if required, and reinstalled before closure of the joint is attempted. When specified in the Contract Documents, nitrile gaskets shall be used.

The pipe shall be properly positioned by means of an appropriate mechanism. Sufficient pressure shall be applied in making the joint to ensure that the joint is in position. Sufficient restraint shall be applied to the line to ensure that joints are held in this position.

Once the pipe has been jointed, a test shall be made with a feeler gauge at intervals around the joint to ensure that the gasket has not been displaced from the spigot groove. If the gasket is found out of position, the joint shall be opened and the gasket placed in its proper position. If necessary, a new gasket shall be installed.

**421.07.12.02 Circular Concrete Pipe**

All circular concrete pipe joints shall have elastomeric gaskets.

**421.07.12.03 Non-Circular Concrete Pipe**

All non-circular concrete pipe joints shall be according to the procedures recommended by the manufacturer.

#### **421.07.12.04 Corrugated Steel Pipe Products**

Helical corrugated steel pipe without rerolled ends shall be installed so that the helix angle is constant for the total length of the installation. Each pipe section shall be installed next to the previous section so that the lockseam forms a continuous helix. For rerolled ends, the correct fit of the coupling system does not depend on the location of the helical lockseam and corrugation.

Corrugated steel pipe sections shall be joined by means of steel couplers. The couplers shall be installed to lap approximately equal portions of the pipe being connected so that the corrugations or projections of the coupler properly engage the pipe corrugations. As the coupler is being tightened, it shall be tapped with a mallet to take up the slack.

When joint seals are specified in the Contract Documents, they shall be installed immediately prior to the installation of steel couplers.

Structural plate pipe culverts may be assembled in the trench or beside the excavation. If the assembled structure has to be moved to its final position, it shall be moved so that no damage or distortion is caused to the structure.

When the structural plate pipe culvert has been placed to the alignment and grade as specified in the Contract Documents, all assembly bolts shall be retightened with a torque wrench to a minimum of:

- a) 200 N·m for 3.5 and 3.0 mm gauge of pipe.
- b) 340 N·m for heavier than 3.5 mm gauge of pipe.

#### **421.07.12.05 Polyethylene Pipe**

Polyethylene pipe shall be jointed by one of the following methods, as recommended by the pipe manufacturer:

- a) Bell and Spigot
- b) Welded Joint
- c) Thermal Fusion Joint
- d) Screw-on Coupler
- e) Split Coupler
- f) Threaded Joint

#### **421.07.12.06 Polyvinyl Chloride Pipe**

Polyvinyl chloride pipe shall be jointed, as recommended by the manufacturer, using a bell and spigot joint with an elastomeric gasket.

At the end of a day's work, the last pipe shall be blocked as may be required to prevent movement.

#### **421.07.12.07 Polypropylene Pipe**

Polypropylene pipe shall be jointed by means of a bell and spigot joint with elastomeric gasket or a coupler joint as recommended by the manufacturer to satisfy the pipe joint specification.

**421.07.13 Closed-Circuit Television (CCTV) Inspection**

When specified in the Contract Documents, pipe culverts shall be inspected using CCTV equipment. CCTV inspection of pipe culverts shall be according to OPSS 409.

**421.07.14 Cleaning and Flushing of Pipe Culverts**

When specified in the Contract Documents, pipe culverts shall be cleaned and flushed just prior to inspection and acceptance.

**421.07.15 Clay seal**

Clay seal shall be placed as specified in the Contract Documents and compacted to 95% of the Proctor maximum dry density.

**421.07.16 Concrete Appurtenances**

Concrete appurtenances shall be constructed as specified in the Contract Documents. Concrete in concrete appurtenances shall be placed according to OPSS 904. Steel reinforcement shall be placed according to OPSS 905. Steel grating shall be installed when specified in the Contract Documents.

**421.07.17 Site Restoration**

Site restoration shall be according to OPSS 492.

**421.07.18 Management of Excess Material**

Management of excess material shall be as specified in the Contract Documents.

**421.09 MEASUREMENT FOR PAYMENT**

**421.09.01 Actual Measurement**

**421.09.01.01 Pipe Culverts  
Non-Circular Pipe Culverts  
Pipe Culvert Extensions  
Non-Circular Pipe Culvert Extensions**

Measurement of pipe culverts, non-circular pipe culverts, pipe culvert extensions, and non-circular pipe culvert extensions shall be along the horizontal length of the pipe in metres, from one end of the pipe to the other end of the pipe. When the grade of the pipe culvert is 10% or greater, the above measurement shall then be of the slope length.

**421.09.01.02 Concrete Appurtenances**

Measurement for concrete appurtenances shall be by volume in cubic metres for the volume of concrete placed. Alternatively, concrete appurtenances may be a lump sum item.

**421.09.01.03 Clay Seal**

Measurement for clay seal shall be by volume in cubic metres for the volume of clay placed. Alternatively, clay seal may be a lump sum item.

**421.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**421.10 BASIS OF PAYMENT**

- 421.10.01 "size, type, class" Pipe Culverts - Item**
- "size, type, class" Non-Circular Pipe Culverts - Item**
- "size, type, class" Pipe Culvert Extensions - Item**
- "size, type, class" Non-Circular Pipe Culvert Extensions - Item**
- Clay Seal - Item**
- Concrete Appurtenances – Item**
- Culvert End Section – Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

**421.10.02 Swamp Excavation**

When the Contract requires swamp excavation to place a pipe culvert, payment for the swamp excavation shall be under the tender item covering the swamp excavation for earth embankment construction. No alterations shall be made to the tender item for the pipe culvert so affected.

**421.10.03 Closed-Circuit Television (CCTV) Inspection**

When a CCTV inspection of pipe culverts is specified in the Contract Documents, payment for the CCTV inspection shall be according to OPSS 409.

**Appendix 421-A, November 2018  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Pipe culvert size, type, and class. (421.05.01.01)
- Size and grade of steel reinforcement. (421.05.05)
- Alignment and grade tolerances, including camber, for the pipe installation. (421.07.12.01)
- Pipe culvert cut-end finish, end sections, and safety slope end treatments. (421.07.12.01)
- Alignment and grade for the placement of structural plate pipe culvert. (421.07.12.04)
- Placement of clay seal at the inlet side of culverts, as required. (421.07.15)
- Requirements to construct concrete appurtenances. (421.07.16)
- Pipe culvert size, type, class, shape, clay seal, concrete appurtenances, and end sections to complete the tender item description. (421.10.01)

The designer should determine if the following are required and, if so, add the requirement in the Contract Documents:

- Use of nitrile gaskets. (421.07.12.01)
- Use of joint seals with corrugated steel pipe products. (421.07.12.04)
- CCTV inspection and any other testing. (421.07.13)
- Cleaning and flushing prior to inspection and acceptance. (421.07.14)
- Use of steel grating. (421.07.16)
- Payment of concrete appurtenances by volume or lump sum. (421.09.01.02)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 800.010	Concrete Pipe Culvert and Sewer Extensions Using Corrugated Steel Pipe
OPSD 800.011	Concrete Rigid Frame Box and Open Culvert Extensions Using Corrugated Steel Pipe
OPSD 801.010	Cut End Finish, Circular Pipe and Pipe-Arch Corrugated Steel Pipe
OPSD 801.020	End Section Details, Corrugated Steel Pipe
OPSD 801.030	Bevel Details for Structural Plate Pipe and Pipe-Arch - Corrugated Steel Pipe

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OPSD 801.040	Culvert and Sewer Safety Slope End Treatment, Notes and Tables
OPSD 801.041	Culvert and Sewer Safety Slope End Treatment, Assembly Details
OPSD 801.042	Culvert and Sewer Safety Slope End Treatment, Connection Details
OPSD 801.043	Culvert and Sewer Safety Slope End Treatment, Installation Details
OPSD 802.010	Flexible Pipe Embedment and Backfill, Earth Excavation
OPSD 802.013	Flexible Pipe Embedment and Backfill, Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.020	Flexible Pipe Arch Embedment and Backfill, Earth Excavation
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill, Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment, Original Ground: Earth or Rock
OPSD 802.030	Rigid Pipe Bedding, Cover, and Backfill, Type 1 or 2 Soil - Earth Excavation
OPSD 802.031	Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.032	Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil - Earth Excavation
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OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
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OPSD 802.051	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 3 Soil - Earth Excavation
OPSD 802.052	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Type 4 Soil - Earth Excavation
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill, Rock Excavation
OPSD 802.054	Horizontal Elliptical Rigid Pipe Bedding and Cover in Embankment, Original Ground: Earth or Rock
OPSD 802.095	Clay Seal for Pipe Trenches
OPSD 804.030	Concrete Headwall, for Pipe Less Than 900 mm Diameter
OPSD 804.040	Concrete Headwall, for Sewer or Culvert Pipe Outlet
OPSD 804.050	Grating, for Concrete Endwall
OPSD 805.010	Height of Fill Table, Round Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe
OPSD 805.020	Height of Fill Table, Corrugated Steel Pipe Arch and Structural Plate Corrugated Steel Pipe Arch
OPSD 805.030	Height of Fill Table, Spiral Rib Round Pipe
OPSD 805.040	Height of Fill Table, Spiral Rib Pipe Arch
OPSD 806.020	Height of Fill Table, Dual Wall Corrugated Polyethylene Gravity Sewer Pipe, 210 and 320 kPa
OPSD 806.021	Height of Fill Table, Closed Profile Wall Polyethylene Pipe, RSC 160 and 250
OPSD 806.022	Height of Fill Table, Dual Wall Corrugated Polyethylene Gravity Sewer Pipe RSC 100 and RSC 160
OPSD 806.030	Height of Fill Table, Dual and Triple Wall Corrugated Polypropylene Gravity Sewer Pipe, 320 kPa
OPSD 806.040	Height of Fill Table, Polyvinyl Chloride Gravity Sewer Pipe, 210, 320, and 625 kPa
OPSD 806.060	Height of Fill Table, Polyvinyl Chloride Pressure Pipe for Different Dimension Ratios
OPSD 807.010	Height of Fill Table, Reinforced Concrete Pipe - Confined Trench, Class 50-D, 65-D, 100-D, and 140-D
OPSD 807.030	Height of Fill Table, Reinforced Concrete Pipe - Embankment, Class 50-D, 65-D, 100-D, and 140-D
OPSD 807.040	Height of Fill Table, Non-reinforced Concrete Pipe Class 3
OPSD 807.050	Height of Fill Table, Horizontal Elliptical Concrete Pipe, Class HE-A, HE-I, HE-II, HE-III, and HE-IV





**Note: The MUNI implemented in November 2017 replaces OPSS 491 COMMON, November 2010 with no technical content changes.**

**CONSTRUCTION SPECIFICATION FOR  
PRESERVATION, PROTECTION, AND  
RECONSTRUCTION OF EXISTING FACILITIES**

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**491.01 SCOPE**

This specification covers the requirements of preservation, protection, replacement, and reconstruction of existing services and structures during the installation or removal of sanitary and storm pipe sewers, pipe culverts and end sections, forcemains and associated appurtenances, watermains and associated appurtenances, and other underground Utilities; maintenance holes, catch basins, ditch inlets, or valve chambers; and any other specified subsurface construction.

#### **491.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be as specified in the Contract Documents.

#### **491.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

#### **491.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

##### **Ontario Provincial Standard Specifications, Construction**

OPSS 412	Sewage Forcemain Installation in Open Cut
OPSS 441	Watermain Installation in Open Cut

#### **491.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Associated Appurtenances** means as defined in OPSS 412 and OPSS 441.

## **491.07 CONSTRUCTION**

### **491.07.01 General**

The requirements and regulations of road authorities, Utility companies, and railway companies shall be adhered to at all times.

### **491.07.02 Notification**

All road authorities, Utility companies, and railway companies shall be notified in writing at least 48 hours before approaching their facilities or entering their rights-of-way.

All owners of underground services shall be requested to locate, stake, and clearly mark in the field all underground services which are located on or near the line of the proposed work. Certificates shall be obtained from all owners of underground services having facilities in the area of the proposed work certifying that their facilities have been marked to confirm the Utility location.

Necessary arrangements shall be made with railway companies for the support and protection of their tracks.

### **491.07.03 Existing Services and Structures**

All water or gas mains, sewers or drains, conduits, cables, service pipes, sidewalks, curbs, and all other structures or property in the vicinity of the work, whether above or underground shall be sustained in place and protected from damage. All water and gas service and flow in all sewers, drains, house or inlet connections, and all watercourses encountered during the progress of the work shall be maintained.

Excavation shall be performed with care to expose buried pipes, cables, conduits, and structures whenever trenching operations approach the indicated location of buried services.

If any Utility is broken or damaged, the Utility company shall be immediately notified.

Access to fire hydrants and water and gas valves shall be maintained at all times to the satisfaction of the local authority.

### **491.07.04 Reconstruction of Existing Facilities**

Where an existing Utility is within the limits of or crosses an excavation and cannot be sustained in place, the existing facility shall be removed, realigned, relocated, or replaced as directed in writing by the Contract Administrator. All materials comprising the Utility shall be handled with care, cleaned, salvaged, and inspected before reconstruction commences.

### **491.07.05 Contamination**

The contents of any sewer, drain, or inlet connection shall not be allowed to flow into an excavation.

All offensive matter shall be removed from the proximity of the work.

### **491.07.06 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

## **491.10 BASIS OF PAYMENT**

Payment at the Contract price for the appropriate tender items for the installation of sanitary and storm pipe sewers, pipe culverts and end sections, forcemains and associated appurtenances, watermains and

associated appurtenances, and other underground Utilities; maintenance holes, catch basins, ditch inlets or valve chambers; and any other specified subsurface construction, shall be full compensation for all labour, Equipment, and Material to do the work of the preservation, protection, or reconstruction of existing facilities.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

**Appendix 491-A, November 2017  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**Note: The MUNI implemented in November 2017 replaces OPSS 506 COMMON, November 2013 with no technical content changes.**

## **CONSTRUCTION SPECIFICATION FOR DUST SUPPRESSANTS**

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### **APPENDICES**

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### **506.01 SCOPE**

This specification covers the requirements for dust suppressants and their application.

#### **506.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **506.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **506.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Material**

OPSS 2501 Calcium Chloride  
OPSS 2503 Magnesium Chloride Solid and Magnesium Chloride Solution

### **Others**

Environmental Protection Act, Ontario Regulation 347, General - Waste Management - R.R.O. 1990

Ministry of the Environment and Climate Change (MOECC) - Certificate or Provisional Certificate of Approval for a Dust Suppression Waste Management System

## **506.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **506.04.01 Submission Requirements**

Dust suppressants other than water, calcium chloride solid, calcium chloride solution, magnesium chloride solid, magnesium chloride solution, and calcium-magnesium chloride blend, or as specified in the Contract Documents shall be approved by the Contract Administrator. The following shall be submitted with a request to approve the dust suppressant within one week of execution of the Contract:

- a) The name of the material.
- b) The name of the manufacturer or supplier.

- c) The manufacturer's guidelines and recommendations for application rates that meet or exceed the performance of calcium chloride or magnesium chloride.

Dust suppressants containing waste material shall be as approved by the Contract Administrator. A copy of a Certificate or Provisional Certificate of Approval for a Dust Suppression Waste Management System shall also be included with the request to approve the dust suppressant. The certificate shall be valid for:

- a) The entire period of the Contract.
- b) The entire area within the limits of the Contract and the entire haul route.
- c) The equipment to be utilized.
- d) The point of supply.
- e) The relevant Ministry of Environment waste classification.
- f) Mixtures with any other material, with the exception of water, if mixtures are to be applied.

Prior to the application of dust suppressants containing waste material, the Contract Administrator shall be provided with a completed blue coloured copy (#5) of the Ontario Regulation 347, General - Waste Management manifest for each shipment of waste.

**506.05 MATERIALS**

**506.05.01 Water**

Water shall be free of contaminants that could adversely affect fill material or the environment.

Water shall be free of foreign material that would alter the dust suppressant solution or cause blockage in the spray equipment.

**506.05.02 Calcium Chloride Solid, Calcium Chloride Solution, and Calcium-Magnesium Chloride Blend**

Calcium chloride solid, calcium chloride solution, and calcium-magnesium chloride blend shall be according to OPSS 2501.

Calcium chloride solution may be substituted for calcium chloride solid.

**506.05.03 Magnesium Chloride Solid and Magnesium Chloride Solution**

Magnesium chloride solid and magnesium chloride solution shall be according to OPSS 2503.

Magnesium chloride solution may be substituted for magnesium chloride solid.

**506.06 EQUIPMENT**

**506.06.01 General**

Application equipment shall be capable of distributing the dust suppressant in a uniform manner at an application rate specified in the Contract Documents.



**506.06.02****Pressure Distributors**

Pressure distributors shall be propelled by a power unit capable of accurately maintaining any speed required for spraying and shall be provided with the following minimum equipment:

- a) A pump capable of developing in the spray manifold a constant uniform pressure to sustain the required application.
- b) A pressure gauge indicating the pressure within the spray bar graduated in increments of 15 kPa or less and visible to the operator.
- c) A rear mounted spray bar having a cab-activated positive and instant shut off that can be set at variable heights parallel to the surface and to any spraying width from 1 to 3 m to spray any portion of the roadway surface, including the shoulders. The spray bar nozzles shall be:
  - i. All of the same manufacture and size.
  - ii. Clean and in good working condition.
  - iii. Designed and set to ensure uniform fan shaped spray without atomization.

Nozzles shall be set in the spray bar at an angle permitting each spray fan to overlap adjacent spray fans in such a manner that complete coverage of the spray area is maintained should there be a malfunction of one nozzle.

- d) A strainer installed in the feed system to prevent clogging of the spray bar nozzles.
- e) A device or method that allows the operator to determine the volume remaining in the tank to an accuracy of 200 litres.
- f) Splash guards or other approved devices for shoulder spraying that shall permit spraying immediately adjacent to the pavement without over-spraying the pavement surface.
- g) A system (e.g., meter, GPS device, ground speed sensors, or calibration charts) that allows the operator to determine the rate of application with accuracy while spreading the dust suppressant.

**506.07****CONSTRUCTION****506.07.01****General**

Dust suppressants shall be applied according to the obligations imposed by any Certificate or Provisional Certificate of Approval for a Dust Suppression Waste Management System.

Water shall be the only dust suppressant applied within two weeks before the placement of any asphaltic concrete materials or the application of surface treatments.

Approved dust suppressants other than water, calcium chloride solid, calcium chloride solution, magnesium chloride solid, magnesium chloride solution, and calcium-magnesium chloride blend shall be applied according to the manufacturer's guidelines and application rates.

Steps shall be taken as necessary to control dust resulting from operations or by public traffic such that it does not:

- a) affect traffic,
- b) enter surface waters, or

c) escape beyond the right-of-way to cause a nuisance to residents, businesses, or utilities.

Dust suppressants shall be applied in a manner that avoids ponding, runoff, drifting, and tracking of the material beyond the area of application.

Dust suppressant application shall not proceed during periods of rain when the surface is in a saturated condition or on areas of ponded water.

Dust suppressants other than water shall not be applied when weather forecasts indicate a high probability of rainfall in order to minimize loss of the material from the intended area of application. Areas receiving rainfall within 6 hours after application may require reapplication of the material.

Dust suppressants containing waste material shall not be stored on the Owner's property.

#### **506.07.02 Dust Suppressant Solution**

Dust suppressant solutions shall be applied by a pressure distributor. The application rate per kilometre shall be confirmed by running 250 m test sections in the presence of the Contract Administrator. Solution application rates shall be measured in t/km or in L/m<sup>2</sup>.

For the maintenance of existing roadways, dust suppressant solutions shall be applied to a prepared surface. Work shall commence within 3 Working Days of receiving notice from the Contract Administrator and shall proceed continuously until completed.

#### **506.07.03 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

### **506.09 MEASUREMENT FOR PAYMENT**

#### **506.09.01 Water for Dust Suppression**

Measurement of water for dust suppression shall be by volume in cubic metres by one of the following methods for the quantity used in the work:

- a) The mass of the water shall be determined by weighing according to the Contract Documents and shall be the difference between the mass of the empty water tank and carrying vehicle and the mass of the full tank and carrying vehicle. The mass of the water shall be converted to cubic metres using a factor of 1,000 kg to 1 m<sup>3</sup>.
- b) The water tank shall be measured and its volume computed in cubic metres.
- c) The water shall be measured through a water meter acceptable to the Contract Administrator.

#### **506.09.02 Calcium Chloride Solid and Magnesium Chloride Solid**

Measurement for calcium chloride solid and magnesium chloride solid shall be by mass in kilograms.

#### **506.09.03 Calcium Chloride Solution**

Measurement of calcium chloride solution shall be by mass in tonnes of solution, by volume in litres of solution, or by mass of equivalent solid as specified in the Contract Documents. The mass and volumetric measurement of calcium chloride solution shall be according to OPSS 2501.

**506.09.04                    Magnesium Chloride Solution**

Measurement of magnesium chloride solution shall be by mass in tonnes of solution, by volume in litres of solution, or by mass of equivalent solid as specified in the Contract Documents. The mass and volumetric measurement of magnesium chloride solution shall be according to OPSS 2503.

**506.09.05                    Calcium-Magnesium Chloride Blend**

Measurement of calcium-magnesium chloride blend shall be by mass in tonnes of solution or by volume in litres of solution as specified in the Contract Documents. The mass and volumetric measurement of calcium-magnesium chloride blend shall be according to OPSS 2501.

**506.10                        BASIS OF PAYMENT**

- 506.10.01                    Water for Dust Suppression - Item**
- Calcium Chloride Solid - Item**
- Calcium Chloride Solution - Item**
- Magnesium Chloride Solid - Item**
- Magnesium Chloride Solution - Item**
- Calcium-Magnesium Chloride Blend - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract does not contain a separate tender item for any of the above items, the Contract price for the applicable tender item for which dust suppression is required shall be full compensation for all labour, Equipment, and Material to do the work.

**Appendix 506-A, November 2017  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- The dust suppressant material by type. (506.04.01)
- Method of measurement for dust suppressant solution. (506.09.03, 506.09.04, 506.09.05)
- A tender item for payment of a dust suppressant. (506.10.01)

When a dust suppressant other than water, calcium chloride solid, calcium chloride solution, magnesium chloride solid, magnesium chloride solution, or calcium-magnesium chloride blend is to be applied, the concentration and the volumetric conversion should be identified.

The proper use and application of all dust suppressants is the responsibility of the applicator and is subject to applicable Ministry of Environment requirements under legislation such as the *Environmental Protection Act* (EPA) and the *Ontario Water Resources Act*.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**CONSTRUCTION SPECIFICATION FOR  
CHAIN-LINK FENCE**

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<b>772-A</b>	<b>Commentary</b>
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**772.01 SCOPE**

This specification covers the requirements for the installation of chain-link fence.

**772.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **772.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **772.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 904 Concrete Structures

### **Ontario Provincial Standard Specifications, Material**

OPSS 1541 Chain-Link Fence Components

### **CSA Standards**

W59-13 Welded Steel Construction (Metal Arc Welding)

### **ASTM International**

A 123/A 123M-17	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A 780/A 780M-09 (2015)	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
B 209-14	Aluminum and Aluminum-Alloy Sheet and Plate

For the purpose of this specification, the following definitions shall apply:

**Barbed Wire** means the twisted longitudinal wires, termed line wires, to which the barbs are attached.

**Barbed Wire Arm** means the metal arm to support the barbed wire.

**Bottom Wire** means the wire installed at the bottom of fence and fastened to the bottom of the fence fabric and extending throughout each section of fence between terminal posts.

**Brace Band** means a symmetrically formed strip of metal shaped to fit around a post and used with a carriage bolt and nut to attach the rail end or brace rail end to the post. Also, used for attaching barbed wire, tension wire, and other items to a terminal post.

**Brace Rail** means a tubular or fabricated steel section used for bracing terminal posts.

**Corner Post** means a terminal post when the direction of the line of fence changes in two or more directions.

**Diagonal Brace Wire** means the wire used for bracing terminal posts.

**End Post** means the fence post positioned at the ends of a section of fence.

**Fence Post** means an upright tubular or fabricated steel member for supporting fencing material.

**Fitting** means the mechanical connection of various designs, shapes, and metals to join fence components into an integral structure.

**Gatepost** means a terminal post on each side of a gate forming a gateway.

**Hog Ring** means a preformed open wire clip designed to close up into a ring to secure chain-link fabric to horizontal top and bottom wires.

**Knuckled** means the type of selvage obtained by interlocking adjacent wire ends in pairs and then bending the wire ends back into a closed loop.

**Line Post** means the fence post spaced at regular intervals between terminal posts throughout each section of fence.

**Line Post Cap** means a cap or top with a loop or hole used to position the top rail or top wire on top of the line posts. It also prevents water from entering the tubular post.

**Marcelled Tension Wire** means a type of wire manufactured with either a uniform helix or a series of waves put into the wire to facilitate tensioning the wire when installed to support the top or bottom of the chain-link fence fabric.

**Post Sleeve** means a specified length of tube or pipe set into a concrete retaining wall into which fence posts are placed.

**Rail End** means a cup-shaped fitting used with a brace band to connect the top rail or brace to a post.

**Selvage** means the edge finish on woven chain-link fabric joining pairs of pickets. The selvage may be knuckled or twisted.

**Straining Post (or Pull Post)** means a terminal post in a line of fence to brace a long stretch or to effect a change in elevation along a fence line.

**Tension Band** means an offset strip of metal shaped to fit around the terminal post and used with a carriage bolt and nut to attach the tension bar to the post.

**Tension Bar** means the bar used with tension bands to secure the fence fabric to a terminal post.

**Terminal Post** means end, gate, corner, and straining post.

**Terminal Post Cap** means a cap atop a post (end, gate, corner or straining post) that prevents water from entering the tubular post.

**Top Rail** means a tubular or fabricated steel section continuously joined by means of sleeves or couplings throughout all sections of fence extending between terminal posts.

**Top Rail Sleeve** means a fitting used to join two pieces of top rail when swedged top rail is not used.

**Top Wire** means the wire installed at the top of fence and extending continuously throughout all sections of fence between terminal posts.

**Twisted** means the type of selvage obtained by interlocking adjacent wire ends in pairs and then twisting the wire at least two turns with the wire ends above the twist.

**Wire Ties** means the wire used to tie chain-link fence fabric to line posts, bottom wires, and top rails or top wires.

## **772.05 MATERIALS**

### **772.05.01 Chain-Link Fence**

Chain-link fence components shall be according to OPSS 1541.

### **772.05.02 Concrete**

Concrete shall have a nominal minimum 28-Day compressive strength of 20 MPa.

## **772.07 CONSTRUCTION**

### **772.07.01 Site Preparation**

Prior to the commencement of fencing operations, all debris shall be removed and ground undulations shall be corrected along the fenceline to obtain a smooth and uniform gradient.

All trees, stumps, and brush along the fenceline shall be cut off at ground level and all logs and overhanging branches that interfere with the installation of the fence shall be removed.



**772.07.02 Chain-Link Fence**

**772.07.02.01 General**

Chain-link fence shall be installed at locations specified in the Contract Documents.

Survey reference points or permanent property boundary markers shall not be disturbed or moved without the authorization of the Contract Administrator. When it is necessary to set posts adjacent to such points, the posts shall be placed on the roadway side of the property line as close as feasible to the monuments or markers.

**772.07.02.02 Post Installation**

**772.07.02.02.01 General**

All posts shall be installed plumb and to the depth specified in the Contract Documents.

Posts shall be cut to the required height above the ground to present a smooth and uniform profile. Line post spacing shall be in equal horizontal distances with a maximum of 3,000 mm between line posts.

All posts shall be fitted with waterproof metal caps designed to fit and fasten securely over the posts. All line post caps shall carry either the top rail or top wire as specified in the Contract Documents.

Corner posts shall be installed at horizontal deflections in the fence line of 10 degrees or more.

Straining posts shall be installed at equal intervals not exceeding 150 m. Additional straining posts shall be installed when changes in vertical alignment of the fence exceed 30 degrees.

**772.07.02.02.02 Posts On Concrete Barrier**

All posts installed on concrete barrier shall be according to the Contract Documents.

Each post shall be fabricated with a welded steel base plate grade 300W, hot dip galvanized according to ASTM A 123, and according to the Contract Documents. All welds shall be to a low hydrogen classification according to CSA W59. Manual electrodes shall be E7015, E7016, or E7018. All welds shall be continuous.

**772.07.02.02.03 Footings**

All posts shall be installed according to the Contract Documents.

Concrete placing, curing, and protection from the elements shall be according to OPSS 904.

**772.07.02.03 Bracing**

A brace rail or brace wire shall be placed diagonally across the panel at all ends and gateposts. Corner and straining posts shall be supported with diagonal braces placed on both sides of the post. The higher end of the diagonal brace shall be connected at the terminal post.

End fittings shall be secured by a 6 mm bolt placed through the fitting and braced at both ends of the brace.

#### **772.07.02.04 Top Rails, Top Wires, and Bottom Wires**

Top rails or top wires shall be installed as specified in the Contract Documents.

Top rails or top wires shall be fastened securely to line post tops using waterproof caps.

In sag locations, the post and cap shall be drilled and fastened with a self-tapping screw to ensure a secure fit.

Top rails shall be fastened to terminal posts with centre bands.

Top and bottom wires shall be stretched tight and securely fastened to terminal posts with turnbuckles and centre bands.

One turnbuckle shall be used between terminal posts.

#### **772.07.02.05 Fence Fabric**

Fence fabric shall not be installed until the concrete footings have cured for a minimum of 5 Days.

The fabric shall be stretched tight and securely fastened to terminal posts with steel tension bars and steel or aluminum tension bands. The longitudinal axis of the diamond pattern shall be perpendicular to the slope of the top rail or top wire.

The fabric shall be placed on the side of the post nearest the roadway with the barbed edge at the top, except on curves of 50 m or smaller radius, the fabric shall be placed on the side of the post away from the centre of the curve.

The fabric shall be securely fastened to the line posts, bottom wire, and top rail or top wire with wire ties. The fabric shall not be fastened to any diagonal braces.

Manually fastened round wire ties shall engage one strand of the chain-link fence fabric with one end of the tie by wrapping it with two 360 degree turns and then wrapping the body of the tie around the post or top rail a minimum of 180 degrees. The remaining end of the tie shall be secured to the second strand of the chain-link fence fabric by wrapping it with two 360 degree turns. The fabric and the main body of the tie shall be drawn tightly to the rail or post.

Power fastened wire ties shall engage two strands of the chain-link fence fabric at a diamond joint closest to the post or top rail. The manufacturer's installation instructions shall be followed to complete the operation. The ends shall be twisted three full twists or one and one half machine turns. The end of the tie shall be positioned on the post or rail so that it is parallel to the chain-link fence fabric.

The ends of wire ties shall not protrude beyond the vertical plane on either side of the chain-link fence fabric. Protruding ends of wire ties shall be removed.

The hog rings on top and bottom wires shall be installed according to the Contract Documents.

#### **772.07.02.06 Barbed Wire**

Barbed wire shall be installed when specified in the Contract Documents. The barbed wire shall be pulled taut to remove all slack and shall be firmly installed in the slots of the barbed wire arms. The ends of the barbed wire shall be securely connected at the terminal posts with brace bands. Barbed wire arms shall be installed with the arm pointing away from the roadway.

### **772.07.03 Gates**

Gates shall be installed at locations and of the type and size as specified in the Contract Documents.

#### **772.07.03.01 Gate Installation**

Gates shall be constructed with the fabric on the side furthest from the roadway with the barbed edge at the top.

All gates shall have a chain hook to hold gates open and double gates shall have a steel gate centre rest with a drop bolt for the closed position.

The surface grade within the required gate sweep area shall be low enough to permit free movement of the gate.

#### **772.07.04 Marking**

Identification plates, provided by the material supplier, shall be securely attached to the completed fence installation at the following intervals:

- a) At the start and end of each fence installation.
- b) At a maximum interval of 300 m.

The fence identification plate shall be located within 300 mm of a terminal post with the top of the plate located approximately 300 mm from the top of the fence fabric. The maximum dimensions of the plate shall be 200 by 200 mm. The plate shall be made from 0.81 mm thick anodized aluminum sheet according to ASTM B 209 series 1100 or 5005-H34.

Each fence identification plate shall be engraved with the following information:

- a) Contract number.
- b) Name or trademark of fence Subcontractor.
- c) Name or trademark of fence supplier (i.e., supplier(s) of fence fabric and posts)
- d) Date of completed installation (i.e., yyyy-mm).

The height of the letters and numerals shall be within the range of 6 to 32 mm.

#### **772.07.05 Zinc Coating Repairs**

Cut ends, field drilled holes, and damaged areas of hot dip galvanized coatings on galvanized components shall be repaired according to ASTM A 780.

#### **772.07.06 Site Restoration**

After fence installation, the site shall be cleaned and trimmed and the ground restored to a neat and original condition existent prior to the fencing operations.

#### **772.07.07 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**772.08 QUALITY ASSURANCE**

**772.08.01 Construction**

The Contract Administrator may perform a spot visual inspection to determine conformance with the workmanship, design, and dimensional requirements of this specification.

Failure to conform to the specification may result in a partial or complete inspection of the installation and removal and replacement of all defective workmanship or materials.

**772.08.02 Material Certification**

Certificates of compliance for each fence component used in the installation shall be provided to the Contract Administrator. The certificate of compliance shall indicate that the material was manufactured, sampled, tested, and inspected in accordance with the reference specification and has been found to meet the requirements.

Each certificate of compliance shall include the following information typed on company letterhead:

- a) Manufacturer's name or trademark.
- b) General description of the component.
- c) Reference specification for material (e.g., CGSB 138.1 Fence Fabric for Chain-Link Fence).
- d) Signed and dated by the manufacturer's authorized representative.

All certificates of compliance shall be assembled and submitted to the Contract Administrator prior to completion of the Work.

**772.08.03 Material Sampling**

The Contract Administrator may obtain and test samples to ensure compliance with the specifications. Products represented by the test samples that are not in compliance shall be removed from the Work Area and replaced.

**772.09 MEASUREMENT FOR PAYMENT**

**772.09.01 Actual Measurement**

**772.09.01.01 Chain-Link Fence**

Measurement of chain-link fence shall be by length in metres along the contour of the ground for the actual length of fence installed and shall include gate openings.

**772.09.01.02 Gates**

For measurement purposes, a count shall be made of the number of gates installed, regardless of the size and type. Double gates shall be counted as one gate.

**772.09.02 Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**772.10 BASIS OF PAYMENT**

**772.10.01 Chain-Link Fence - Item  
Gates - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

**772.10.02 Removals and Replacements**

Costs associated with any required removals and replacements of defective workmanship or materials shall be the Contractor's responsibility at no cost to the Owner.

**Appendix 772-A, April 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Chain-link fence locations. (772.07.02.01)
- Locations of top rail or top wire to be used. (772.07.02.02.01)
- Barbed wire locations. (772.07.02.06)
- Gate locations, type, and size. (772.07.03)

The designer should consider the placement of the fence fabric in relation to the post when the fence is located between two roadways and when snow loading from ploughing operations could separate the fence fabric from the post, (e.g., freeway and service road).

When chain-link fence is located adjacent to a highway, a top rail represents a potential spearing hazard. The default installation method will be to install chain-link fence with top wire. For those installations where the chain-link fence will be installed in a non-roadside installation (e.g., park, recreation facility, storm water management facility, etc.), when, as a minimum, the chain-link fence is located beyond the clear zone, the designer may specify a top rail when desired. (772.07.02.02.01 and 772.07.02.04)

See MTO Roadside Design Manual for additional information.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 972.101	Fence, Chain-Link, Component - Barbed Wire
OPSD 972.102	Fence, Chain-Link, Component - Gate
OPSD 972.130	Fence, Chain-Link, Installation - Roadway
OPSD 972.131	Fence, Chain-Link, Installation - Concrete Barrier
OPSD 972.132	Fence, Chain-Link, Details and Table



## **CONSTRUCTION SPECIFICATION FOR TOPSOIL**

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### **802.01 SCOPE**

This specification covers the requirements for stockpiling, supplying, and placing topsoil.

#### **802.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **802.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **802.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206	Grading
OPSS 501	Compaction
OPSS 804	Seed and Cover
OPSS 805	Temporary Erosion and Sediment Control Measures

### **Ontario Provincial Standard Specifications, Materials**

OPSS 1860	Geotextiles
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### **Ontario Ministry of Transportation Publications**

Laboratory Testing Manual:

LS-706	Moisture - Density Relationship of Soils Using 2.5 kg Rammer and 305 mm Drop
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### **ASTM International**

D2974-14	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D4972-13	pH of Soils



**802.05 MATERIALS**

**802.05.01 Topsoil**

Topsoil shall be a fertile loam material that is free of roots, vegetation, or other debris of a size and quantity that prevents proper placement of the topsoil. The topsoil shall not contain material greater than 25 mm in size, such as stones and clods.

Imported topsoil shall not have contaminants that adversely affect plant growth.

Topsoil shall not be from swamps or muskeg areas, unless specified in the Contract Documents.

Topsoil shall meet the following physical property requirements or as specified the Contract Documents:

- a) Have an organic content between 7 and 11% by weight, according to ASTM D2974; and
- b) Have a pH from 6.0 to 8.0 according to ASTM D4972.

**802.07 CONSTRUCTION**

**802.07.01 Stockpiling Topsoil**

Topsoil shall be removed, stockpiled, and managed as specified in the Contract Documents.

Stockpiles shall not exceed 3 m in height.

Stockpiles shall be constructed neatly with uniform surfaces. When required, the top surface shall be dished.

Stockpiles shall be protected from erosion by covering with tarps or geotextile according to OPSS 1860 to prevent soil erosion and contamination by weeds during storage. Alternatively, topsoil stockpiles can be stabilized by temporarily establishing groundcover vegetation composed of non-invasive species by application of seed according to OPSS 804. Mounds shall be completely surrounded by sediment barriers or compost filter socks according to OPSS 805.

**802.07.02 Preparation for Topsoil**

Areas where topsoil is to be placed shall be graded according to OPSS 206. The surface shall be scarified to a depth of 50 to 100 mm. It shall be free of all vegetation, debris, and stones which would not be covered by the depth of topsoil specified in the Placement of Topsoil subsection.

These areas shall be maintained in the condition described above until the topsoil is placed.

**802.07.03 Placement of Topsoil**

Topsoil shall be tested 15 Business Days before placement for the physical quality requirements listed in the Topsoil subsection.

Topsoil shall be placed to a uniform depth of 150 mm on areas specified in the Contract Documents and up to the subgrade elevation on the roadway front slope.

Soil from swamps or muskeg areas, when used in place of topsoil, shall be placed according to the Contract Documents to a uniform depth of 150 mm, with no woody material protruding more than 50 mm above the surface.

**802.07.04                    Compaction of Topsoil**

Compaction of the topsoil, if required, shall not exceed 85% of its maximum dry density, according to LS-706.

**802.07.05                    Quality Control**

**802.07.05.01                Compaction Testing of Topsoil**

Compaction testing shall be based on material placed and compacted in the work on a Lot-by-Lot basis according to Table 1.

Compaction acceptance shall be according to the Acceptance of Compaction subsection.

**802.07.06                    Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**802.08                        QUALITY ASSURANCE**

**802.08.01                    General**

A laboratory designated by the Owner may carry out QA testing for purposes of ensuring that the topsoil used in the Work is according to the requirements of this specification. Test results shall be forwarded to the Contractor, as they become available.

The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise specified in this specification.

**802.08.02                    Properties of Topsoil**

A minimum of one random duplicate sample of surface soil shall be taken from each Lot, according to the Lot schedule shown in Table 1.

One portion of the duplicate sample representing each Lot shall be tested for the requirements listed in the Topsoil clause.

The Lot of topsoil shall be deemed to be acceptable if all of the test results for the sample representing that Lot meet all applicable requirements of this specification.

If QA test results do not meet all of the requirements of this specification, then the entire Lot shall be rejected and replaced; the Contractor may submit a proposal for remediation or for use of the topsoil, subject to the approval of the Owner.

**802.08.03 Acceptance of Compaction**

Acceptance testing for compaction of topsoil shall be conducted in Lots according to Table 1, according to OPSS 501, for earth, with the exception of the following:

- a) Control strips shall not be used to establish target densities; and
- b) A Lot shall be considered acceptable for compaction, if:
  - i. The mean percent compaction of the individual test results for the 4 sublots is between 80 and 85%; and
  - ii. No more than two individual test results are less than 78% or greater than 87%; of the soil's maximum dry density, according to LS-706, and tested according to OPSS 501.

**802.08.04 Referee Testing**

Referee testing may be invoked for one or more physical property attributes by submitting a written request to the Contract Administrator, within 5 Business Days following notification that a sample representing a Lot of topsoil does not meet the requirements of this specification.

Referee testing shall be carried out, as specified elsewhere in the Contract Documents. The retained duplicate QA samples shall be used for referee testing.

All referee test results for each Lot shall replace the respective QA test results for acceptance of the applicable Lot and those results shall be binding on both the Owner and the Contractor.

If a Lot is not accepted, based on the referee test results, then the Contractor shall be responsible for the cost of the referee testing of that Lot, at the rates specified in the Contract Documents.

In all other cases, the Owner shall bear the cost of the referee testing.

**802.09 MEASUREMENT FOR PAYMENT**

**802.09.01 Actual Measurement**

**802.09.01.01 Topsoil from Stockpiles**

Measurement shall be by volume in cubic metres of topsoil placed from a stockpile.

**802.09.01.02 Topsoil, Imported**

Measurement shall be by volume in cubic metres of topsoil imported and placed.

**802.10 BASIS OF PAYMENT**

**802.10.01 Topsoil**

Rejected material shall not be used and shall be removed and replaced, at no additional cost to the Owner.

**802.10.02 Compaction**

Any Lot that does not meet the requirements, shall be scarified and compacted to meet the requirements listed in Acceptance of Compaction subsection b), at no additional cost to the Owner.

**802.10.03                      Preparation for Topsoil - Item**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

Payment for this item shall be on surfaces graded under a previous Contract that require preparation for topsoil.

There is no payment for this item on surfaces constructed on this Contract.

**802.10.04                      Topsoil from Stockpiles - Item**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

**802.10.05                      Topsoil, Imported - Item**

Payment at the Contract price for the above item shall be full compensation for all labour, Equipment, and Material to do the work.

**TABLE 1**  
**Lot Schedule for Sampling and Testing of Topsoil**

<b>Quantity of Topsoil Used (m<sup>3</sup>)</b>	<b>Quantity of Topsoil Used (m<sup>2</sup>)</b>	<b>Minimum Lot Schedule</b>
< 100	< 670	Sampling and Testing Shall be Carried out at the Discretion of the Contract Administrator
100 - 500	670 - 3,330	One Lot
> 501 - 1,000	> 3,331 - 6,670	Two Lots
> 1,001	> 6,671	One Lot per 1000 m <sup>3</sup>

**Appendix 802-A, November 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Topsoil from swamps or muskeg areas. (802.05.01)
- Topsoil requirements in natural areas where pH and/or organic content may fall outside required ranges. (802.05.01)
- Topsoil removal and stockpiling areas. (802.07.01)
- Topsoil placement areas. (802.07.03)
- Topsoil placement areas from swamps or muskeg areas. (802.07.03)
- Rates of the referee testing. (802.08.04)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.



**CONSTRUCTION SPECIFICATION FOR  
SEED AND COVER**

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**804.01 SCOPE**

This specification covers the requirements for seeding with either rolled erosion control products or hydraulically applied erosion control products.

**804.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **804.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **804.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Ministry of Transportation Publication**

Seeding and Cover Quality Assurance Visual Inspection Field Guide

### **Canadian and Provincial Statutes**

Canada Fertilizers Act (R.S., 1985, c. F-10)

Canada Seeds Act (R.S., 1985, c. S-8)

## **804.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Cover** means any approved or specified material such as rolled erosion control products, (i.e., blankets) or hydraulically applied erosion control products (i.e., hydraulic mulch, bonded fibre matrix, fibre reinforced matrix) applied at the time of seeding to provide temporary erosion control and protection of the germinating seed.

**Cultivate** means to prepare and work the soil with agricultural implements to provide a specified depth of loose, friable soil as a suitable medium to germinate seed.



**Fibre Reinforced Matrix (FRM)** means any approved or specified hydraulically applied erosion control product applied to provide cover, in which mechanical and chemical bonding techniques including water resistant tackifiers and flocculants are used to interlock fibres together to form a matrix that bonds to the soil surface.

**Seeded Earth Area** means the prepared earth area that has received the applied seed and fertilizer.

**Uniform, Cohesive Mat** means an application of cover that is unvarying in consistency and when all of the cover material particles are consolidated and adhere together to produce a solid layer that protects the seeded earth area from heat and adverse environmental conditions, yet allows moisture to percolate into the underlying soil.

**Waterbody** means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

## **804.04 DESIGN AND SUBMISSION REQUIREMENTS**

### **804.04.01 Submission Requirements**

A legible, valid Certificate of Seed Analysis from a seed testing laboratory approved by the Canadian Food Inspection Agency for all single seed species and all seed mixtures to be used on the Contract shall be provided to the Contract Administrator 24 hours prior to any seeding operations.

## **804.05 MATERIALS**

### **804.05.01 Seed**

#### **804.05.01.01 Grade Standards**

All seed supplied, either as single seed species or as a seed mix shall comply with the provisions of the Canada Seeds Act and Regulations and the grade standards for that particular seed type.

Birdsfoot Trefoil mix shall contain only certified Blue Tag Leo Birdsfoot Trefoil.

#### **804.05.01.02 Certificate of Seed Analysis**

The Certificate of Seed Analysis shall stipulate the seed supplier's lot designation numbers.

Test results from the Certificate of Seed Analysis shall specify germination and purity for each seed species of the mix, as well as the seed mix composition expressed as a percentage of each seed species by mass for each seed mix specified in the Contract Documents. Test results shall comply with the values shown in Table 1 for the various seed mixes.

#### **804.05.01.03 Seed Packaging, Labelling, and Storage**

All seed and seed mixes shall be in the original factory sealed package with the original legible label securely attached.

Labelling shall be in accordance with the requirements of the Canada Seeds Act and Regulations. Each package shall be labelled to show:

- a) The name and address of the seed supplier.

- b) The name of the seed mix and the various individual seed species that comprise the seed mix and the percentage by mass of each.
- c) The grade of the seed or seed mix.
- d) The supplier's lot designation number corresponding to the Certificate of Seed Analysis.
- e) Mass in kilograms of the seed mix.
- f) The inoculant type, strain, and expiry date.

All seed and inoculant shall be stored in cool, dry locations until use. Inoculant is only required for seed mixes containing Crown Vetch or Birdsfoot Trefoil.

**804.05.01.04                      Permanent Seed Mixes**

Permanent seed mixes shall be as specified in the Contract Documents and as shown in Table 1.

**804.05.02                              Annual Nurse Crop Seed**

Nurse crop seed shall be either Fall Rye Grain or Winter Wheat Grain, unless otherwise approved by the Contract Administrator.

**804.05.03                              Fertilizer**

Fertilizer shall comply with the provisions of the Canada Fertilizers Act and Regulations. Fertilizer shall be supplied in original factory sealed bags bearing the manufacturer's original label indicating mass and analysis. All fertilizer shall be in granular form being dry, free flowing, free from lumps, and with an analysis shown in Table 2.

**804.05.04                              Cover**

**804.05.04.01                      Straw Mulch**

Straw mulch shall be oat or wheat straw. Straw shall be supplied in bales, dry, and free of weeds and other foreign materials.

**804.05.04.02                      Straw Mulch Tackifiers**

Organic straw mulch tackifiers may include wood and fibre paper mulch or guar and starch based tackifiers. Asphalt based tackifiers are not acceptable.

**804.05.04.03                      Hydraulic Mulch**

Hydraulic mulch shall be capable of dispersing rapidly in water to form a homogeneous slurry and remain in such a state when agitated or mixed with other specified materials. When applied, hydraulic mulch shall be capable of forming a uniform, cohesive mat. Hydraulic mulch shall not inhibit growth or germination of the seed mix. Hydraulic mulch shall be dry, free of weeds and other foreign materials, and shall be supplied in factory sealed packages bearing the manufacturer's label indicating the product name and mass.

#### **804.05.04.04 Bonded Fibre Matrix (BFM) and Fibre Reinforced Matrix (FRM)**

BFM and FRM shall be a hydraulically applied, 100% biodegradable product, which after application is capable of adhering to the soil. In a dry state, BFM shall be comprised of not less than 70% by weight of long stranded wood fibres held together by organic or mineral bonding agents or both. The hydrated BFM shall form a viscous material that creates a high strength, porous, and erosion-resistant uniform, cohesive mat, when applied and dried. The bonding agent shall not dissolve or disperse upon re-wetting. BFM shall not inhibit the germination or growth of plant material.

#### **804.05.04.05 Erosion Control Blanket (ECB)**

ECB shall be of a consistent thickness with a 100% biodegradable even fibre distribution. The ECB shall be covered on top with a biodegradable and photodegradable plastic mesh. ECB may also be sewn together with cotton thread. ECB shall be supplied in a dry rolled mat protected with an outer waterproof wrap bearing the manufacturer's original label indicating product name and application instructions.

#### **804.05.05 Erosion Control Blanket (ECB) Staples**

ECB staples shall be u-shaped, constructed of wire with a diameter of at least 2.5 mm with legs at least 150 mm long and 25 mm apart.

#### **804.05.06 Water**

Water shall be free of any contaminants or impurities that would adversely affect the germination and growth of vegetation.

### **804.06 EQUIPMENT**

#### **804.06.01 Hydraulic Seeder and Mulcher**

The hydraulic seeder and mulcher shall be capable of mixing the materials into homogeneous slurry and maintaining the slurry in a homogeneous state until it is applied. The discharge pumps and gun nozzles shall be capable of applying the materials uniformly over the specified area. A hose extension for the hydraulic seeder and mulcher shall be on site and available for use for areas outside of the range of the gun nozzle.

#### **804.06.02 Straw Mulch Blower**

The straw mulch blower shall be capable of separating straw from the bales without chopping it into short lengths and applying the straw mulch in a uniform, cohesive mat.

When tackifiers are used, the straw mulch blower shall be capable of applying straw mulch and tackifiers simultaneously. The straw mulch blower shall be equipped with a minimum of two nozzles located inside the end of the blower pipe to coat the straw with the tackifier. Crimping may also be used to secure the straw mulch.

#### **804.06.03 Cyclone Spreader**

The cyclone spreader shall be capable of distributing seed and fertilizer uniformly in a dry state.

**804.07 CONSTRUCTION**

**804.07.01 Operational Constraints**

The seeding operation shall not commence until the Contract Administrator is in receipt of the Certificate of Seed Analysis for the seed being applied.

The seeding operation shall not commence until the Contract Administrator has approved the surface preparation, layout of permanent seed mix locations, and different cover types.

Seed and cover application or re-application shall not be carried out under adverse weather conditions such as high wind or heavy rain or when field conditions are not conducive to seed germination such as frozen soil or soil covered with snow, ice, or standing water.

The Contractor shall maintain the site and control erosion until final acceptance of the seed and cover.

Seed or cover shall not come in contact with the foliage of any trees, shrubs, or other vegetation, except as specified in the Seeding subsection. Seed or cover shall not come in contact with waterbodies.

BFM or FRM shall be installed by a Contractor certified and trained by the manufacturer in the proper mixing and installation of the product. To ensure a suitable drying and curing period, BFM and FRM shall not be applied when rainfall is expected, during rainfall, or immediately after rainfall.

**804.07.02 Surface Preparation for Seeding**

The surface to be seeded shall be prepared not more than 7 Days prior to the seeding operation.

At the time of seeding, all surface areas designated for seeding shall have a fine-graded uniform surface and shall exhibit no evidence of erosion. The surface shall be uniformly cultivated to a minimum depth of 50 mm and shall not have surface stones greater than 25 mm in diameter, foreign material, and weeds or other unwanted vegetation.

**804.07.03 Layout**

The locations and limits of the different permanent seed mixes and different cover types as specified in the Contract Documents shall be staked out on the ground surface.

**804.07.04 Seeding**

**804.07.04.01 Application Rates for Seed, Fertilizer, and Water**

Application rates for primary seed, nurse crop seed, and fertilizer shall be as shown in Table 2.

**804.07.04.02 Seed and Fertilizer Application**

Seed and fertilizer shall be applied prior to the application of cover.

Seed, fertilizer, and water shall be thoroughly mixed in the hydraulic seeder and mulcher into a homogeneous water slurry. When thoroughly mixed, the water slurry shall be applied to the prepared earth areas by the nozzle sprayer or extension hose.

The Contractor shall ensure that the seeding equipment is calibrated to provide the coverage shown in Table 2. The Contractor shall ensure there is a uniform dispersal of the mixed material over the entire area designated for seeding and that the spray does not dislodge soil or cause erosion.

Seed and fertilizer may also be applied separately by a cyclone spreader. Seeding shall overlap the adjoining ground cover by 300 mm.

#### **804.07.05 Cover Applications**

All cover materials shall be applied as a separate operation immediately following the application of seed and fertilizer.

The Contractor shall ensure that the hydraulic seeder and mulcher are properly calibrated to provide the coverage as specified for each of the hydraulically applied cover materials.

##### **804.07.05.01 Straw Mulch Application**

Straw mulch shall be applied to form a uniform, cohesive mat over 100% of the seeded earth area. The straw mulch shall be applied to a minimum depth of 25 mm and a maximum depth of 50 mm measured at the time of application.

##### **804.07.05.02 Hydraulic Mulch Application**

Hydraulic mulch shall be applied at the rate of 2,000 kg of dry product per 10,000 m<sup>2</sup>. Hydraulic mulch shall be thoroughly mixed with water into a homogenous slurry.

When thoroughly mixed, the hydraulic mulch slurry shall be applied to the seeded earth areas by nozzle sprayer or extension hose. The mixed material shall be evenly dispersed over the entire seeded earth area to form a uniform, cohesive mat. The spray shall not dislodge soil or cause erosion.

##### **804.07.05.03 Bonded Fibre Matrix (BFM) and Fibre Reinforced Matrix (FRM) Application**

BFM and FRM shall be applied at a minimum rate of 3,700 kg of dry product per 10,000 m<sup>2</sup>. BFM or FRM shall be mixed with water in a hydraulic seeder and mulcher at a rate of 20-30 kg of dry product to 500-600 litres of water to form a homogeneous slurry.

When thoroughly mixed, the BFM or FRM slurry shall be applied to the seeded earth areas by nozzle sprayer or extension hose. The BFM or FRM slurry shall be evenly dispersed in successive applications from different directions over the seeded earth area to form a uniform, cohesive mat. The spray shall not dislodge soil or cause erosion.

##### **804.07.05.04 Erosion Control Blanket (ECB) Application**

(ECB) shall be placed and stapled into position according to the manufacturer's installation instructions over the entire designated surface area. Blankets shall be installed in direct contact with the ground surface to form a uniform, cohesive mat over the seeded earth area. The Contractor shall ensure that the ECB is anchored to the soil and that tenting of the ECB does not occur.

On slopes, the uppermost edge of the ECB shall be anchored in a 150 mm wide by 150 mm deep trench when the ECB cannot be extended and anchored over the crest of the slope. The trench shall be backfilled with earth and compacted.

##### **804.07.06 Cleanup**

When seed and cover materials are applied to the foliage of trees, shrubs, other susceptible plant material, or waterbodies, the Contractor shall immediately remove the seed and cover materials from the areas and wash the areas with clean water.

When seed and cover materials are applied to areas or objects other than those designated, the Contractor shall remove the seed and cover materials.

**804.07.07 Management of Excess Material**

Management of excess material shall be as specified in the Contract Documents.

**804.07.08 Protection of Waterbodies and Waterbody Banks**

Protection of waterbodies and waterbody banks shall be as specified in the Contract Documents.

**804.08 QUALITY ASSURANCE**

**804.08.01 Performance Measure**

The Certificate of Seed Analysis shall be reviewed by the Contract Administrator to ensure compliance with the values shown in Table 1.

All seeded areas shall be inspected by the Contract Administrator using the Seeding and Cover Quality Assurance Visual Inspection Field Guide to ensure compliance with this specification at 30, 60, and 90-Day periods following the seeding and Cover operation.

At the 30-Day inspection within the seeded area:

- a) The applied cover shall be visually intact and shall form a uniform, cohesive mat.
- b) Germination of the nurse crop shall be visually evident.

At the 60-Day inspection within the seeded area:

- a) The nurse crop shall be evident at mature height in an evenly dispersed, uniform cover.
- b) Germination of the specified permanent seed species shall be visually evident in an evenly dispersed uniform cover.
- c) There shall not be any significant bare areas, both in terms of quantity and size.
- d) Non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

At the 90-Day inspection within the seeded area:

- a) The specified permanent seed species shall be at an average height of 50 mm in an evenly dispersed, uniform cover.
- b) There shall not be any significant bare areas, both in terms of quantity and size.
- c) Non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

Inspections shall not be made during the winter dormant period or when site conditions prohibit a visual field inspection. The timing intervals between inspections shall be suspended during the winter dormant period shown in Table 3.

**804.08.02 Failure to Meet Performance Measure**

If the values in the Certificate of Seed Analysis for the seeds supplied do not meet the values for seed germination, seed purity, and weed seed content shown in Table 1, the seed lot shall not be approved for use on the Contract and the Contractor shall supply a new seed lot and a new Certificate of Seed Analysis for approval prior to seeding.

If the values in the Certificate of Seed Analysis for the seeds supplied do not meet the values for seed species composition shown in Table 1, the Contractor shall supply a legible, valid copy of the seed mixing sheet from the seed supplier for approval by the Contract Administrator prior to seeding.

If the completed work does not meet the performance measures of the 30-Day inspection, the Contract Administrator shall document the failed areas, notify the Contractor of those areas, and re-inspect at the 60-Day inspection.

If the completed work does not meet the performance measures of the 60-Day inspection, the Contract Administrator shall notify the Contractor in writing of the failed areas. The Contractor shall re-apply the specified material in accordance with this specification within 14 Days of receiving the notification. The Contract Administrator shall re-inspect the seeded area at the 90-Day inspection.

If the completed work does not meet the performance measures of the 90-Day inspection, the Contract Administrator shall notify the Contractor in writing of the failed areas. The Contractor shall re-apply the specified material in accordance with this specification within 14 Days of receiving the notification. The Contract Administrator shall re-inspect the seeded area 30 Days after re-application of material.

Inspections and re-application of material shall continue, as outlined in the 90-Day inspection clause above, until the seeded area has been accepted.

All replaced seed and cover shall be subject to the Quality Assurance section of this specification.

#### **804.08.03 Dispute Resolution**

Dispute resolution only applies to the germination and growth of the permanent seed mix species.

Disputes arising from the performance measure evaluation shall be settled through referee testing using an actual live seedling count of the specified permanent seed mix species within the seeded earth area.

An independent consultant with experience in herbaceous plant identification shall perform the referee testing. Both parties shall agree on the selection of the independent consultant and both parties shall be bound by the consultant's evaluation.

The actual count shall be based on minimum germination requirements and minimum levels of acceptability to meet industry standards and federal legislation governing the testing, inspection, quality, and sale of seed.

To determine the number of seeds per unit of weight, published standard industry lists shall be referenced. When these lists show a range in the number of seeds per unit of weight, the mid-range number shall be used. When there is a difference in the estimated number of seeds by weight from one industry standard list to another, the lower figure shall be used.

To determine the germination rate for each seed species, the number of seeds per unit of weight is factored by the minimum germination rate of 70% in accordance with the Canada Seeds Act. A further 25% reduction is allowed to account for variation in seeding application, seedbed quality, seedbed preparation, and area cover.

The Contractor and the Owner may agree to use a simplified analysis, when instead of counting each seedling of each individual seeded perennial species of the mix, only the total number of seedlings of the mix is counted. If the parties cannot agree to the simplified analysis, the default method is a seedling count of each seeded perennial species.

The field inspection to determine the number of live plant seedlings should only be performed after the 90-Day inspection and when the seedlings reach an identifiable and measurable size.

The sampling procedure should be randomized over an area that both parties agree is representative of the seeded Contract. The selection and evaluation process is as follows:

- a) Select a representative area from the average seeded areas, eliminating the thinnest and thickest growth areas from the analysis.
- b) Measure its length and width. Use a random numbers table to generate five sets of X and Y axis coordinates from the area.
- c) Each axis coordinate is a sampling point. A sampling plot, or quadrat, is set out in a 200 x 1,000 mm plot with the axis coordinate becoming the lower right-hand corner of each quadrat.
- d) Each quadrat is divided into 20 sub-sampling units, each being 100 x 100 mm.
- e) The sub-sampling units are numbered from 1 to 20.
- f) Using a random numbers table, two of the twenty sub-sampling units are randomly selected.
- g) Live seedlings of each individual seeded perennial species of the mix are counted in the selected sub-sampling units to determine actual plant densities.
- h) An average seedling density per seeded perennial species, expressed as the number of seedlings per square metre is generated for each sampling plot or quadrat, based on the data from the two selected sub-sampling units.
- i) The procedure is repeated for the four other sampling points.
- j) The average number of seedlings per square metre for each of the seeded perennial species generated from the five sampling points is evaluated against the minimum industry standard benchmark for the seeded mix.

If the results of the referee testing prove that the seed and cover is unacceptable in meeting the minimum industry standard for germination, the Contractor shall then re-apply seed and cover in accordance with this specification to all areas under dispute. In addition, the Contractor shall be responsible for all costs associated with the dispute resolution process.

If the results of the referee testing prove that the seed and cover is acceptable in meeting the minimum industry standard for germination, the Owner shall then be responsible for all costs associated with the dispute resolution process.

**804.09 MEASUREMENT FOR PAYMENT**

**804.09.01 Actual Measurement**

**804.09.01.01 Seed and Mulch**

Seeding and mulch measurement shall be in square metres following the contours of the ground without any allowance for overlap.

**804.09.01.02 Seed and Erosion Control Blanket**

Seeding and erosion control blanket measurement shall be in square metres following the contours of the ground without any allowance for overlap.



**804.09.01.03                    Seed and Bonded Fibre Matrix (BFM) or Fibre Reinforced Matrix (FRM)**

Seed and BFM or RFM measurement shall be in square metres following the contours of the ground without any allowance for overlap.

**804.09.02                    Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

**804.10                    BASIS OF PAYMENT**

- 804.10.01                    Seed and Mulch - Item**
- Seed and Erosion Control Blanket - Item**
- Seed and Bonded Fibre Matrix or Fibre Reinforced Matrix - Item**

Payment at the Contract price for the above tender items shall be full compensation for all the labour, Equipment, and Material to do the work.

**TABLE 1**  
**Permanent Seed Mixes and Seed Certificate Analysis Values**

<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
<b>Standard Roadside Mix</b>	<b>Canada #1 Lawn Grass Seed Mixture</b>	<b>70</b>	<b>85</b>	<b>0.5</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					50	50 to 60
Kentucky Bluegrass: <i>Poa pratensis</i>					10	25 to 30
Perennial Ryegrass: <i>Lolium perenne</i>					35	12 to 18
White Clover: <i>Trifolium repens</i>					5	2 to 4
<b>Crown Vetch Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					66	62 to 70
Crown Vetch: <i>Coronilla varia</i> inoculated seed					34	30 to 38
<b>Birdsfoot Trefoil Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					66	62 to 70

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<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
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Birdsfoot Trefoil 'Leo': <i>Lotus corniculatus</i> 'Leo inoculated seed					34	30 to 38
<b>Salt Tolerant Mix</b>	<b>Canada #1 Ground Cover Mixture</b>	<b>70</b>	<b>85</b>	<b>3.0</b>		
Tall Fescue: <i>Festuca arundinacea</i>					25	20 to 30
Fults Alkali Grass: <i>Puccinellia distans</i>					20	15 to 25
Creeping Red Fescue: <i>Festuca rubra</i>					25	15 to 25
Perennial Ryegrass: <i>Lolium perenne</i>					20	15 to 25
Hard Fescue: <i>Festuca trachyphylla</i>					10	10 to 15
<b>Lowland Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Creeping Red Fescue: <i>Festuca rubra</i>					35	40 to 50
Brome Grass: <i>Bromus nerris</i>					25	20 to 30
Kentucky Bluegrass: <i>Poa pratensis</i>					10	10 to 20

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<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
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Birdsfoot Trefoil 'Leo': <i>Lotus corniculatus</i> 'Leo' inoculated seed					5	3 to 7
White Clover: <i>Trifolium repens</i>					5	3 to 7
Perennial Ryegrass: <i>Lolium perenne</i>					20	3 to 7
<b>Acidic Soil Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Birdsfoot Trefoil 'Leo', <i>Lotus corniculatus</i> 'Leo' inoculated seed					30	30 to 40
Red Top: <i>Agrostis gigantea</i>					10	20 to 30
Tall Fescue: <i>Festuca arundinacea</i>					15	15 to 20
Creeping Red Fescue: <i>Festuca rubra</i>					30	7 to 12
Hard Fescue: <i>Festuca trachyphylla</i>					5	3 to 7
Alsike Clover: <i>Trifolium hybridum</i>					5	3 to 7
Red Clover: <i>Trifolium pratense</i>					5	3 to 7

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<b>Permanent Seed Mix</b>	<b>Grade Name</b>	<b>Minimum Seed Germination %</b>	<b>Minimum Seed Purity %</b>	<b>Maximum Weed Seed %</b>	<b>Seed Mix %</b>	<b>Seed Species Composition %</b>
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<b>Northern Ontario Mix</b>	<b>Common #1 Forage Mixture</b>	<b>75</b>	<b>N/A</b>	<b>3.0</b>		
Red Top: <i>Agrostis gigantea</i>					10	35 to 40
Timothy: <i>Phleum pratense</i>					10	10 to 20
Creeping Red Fescue: <i>Festuca rubra</i>					30	10 to 15
Birdsfoot Trefoil: <i>Lotus corniculatus</i> 'Leo" inoculated seed					5	6 to 10
Alsike Clover: <i>Trifolium hybridum</i>					3	3 to 7
White Clover: <i>Trifolium repens</i>					2	3 to 7
Bromegrass: <i>Bromus nerrer</i>					20	1 to 5
Hard Fescue: <i>Festuca trachyphylla</i>					10	1 to 5
Meadow Fescue: <i>Festuca pratensis</i>					10	1 to 5

**TABLE 2**  
**Application Rates for Seed and Fertilizer**

Permanent Seed Mixes	Permanent Seed Mix Rate kg/10,000 m <sup>2</sup>	Fertilizer Rate minimum 200 kg/ha			Nurse Crop Rate kg/10,000 m <sup>2</sup>
		8-32-16	0-46-0	0-0-60	
Standard Roadside Mix	130	350	-	-	60
Crown Vetch Mix	100	350	250	-	60
Birdsfoot Trefoil Mix	100	350	250	-	60
Salt Tolerant Mix	130	350	-	-	60
Lowland Mix	130	350	-	-	60
Acidic Soil Mix	130	350	200	200	60
Old Field Mix	100	350	-	-	60

**TABLE 3**  
**Winter Dormant Period**

SOUTHWESTERN ONTARIO	SOUTHERN ONTARIO	NORTHERN ONTARIO
That area of Ontario south of a line joining Grand Bend and Clarkson.	That area of Ontario between the northern and southern boundaries of Southwestern Ontario and Northern Ontario respectively.	That area of Ontario north of a line joining Waubauskene, Severn Bridge, Bancroft, and Ottawa.
November 15 to April 15 inclusive	November 1 to April 30 inclusive	October 15 to May 15 inclusive

**Appendix 804-A, November 2014  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The following should be specified in the Contract Documents:

- Permanent seed mixes. (804.05.01.04)

The designer may select the appropriate seed mix and cover type application from Tables A-1 and A-2 included in this appendix. The designer may propose new site specific seed mixes to suit existing conditions that require a different seed than those specified.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.

**APPENDIX TABLE A-1  
Permanent Seeding Mix Types**

<b>Permanent Seed Mixes</b>	<b>Seed Mix Attributes</b>	<b>Selection Criteria</b>
Standard Roadside Mix	A tested mix of hardy roadside perennial grasses that have performed well in highway situations.	This mix should be the default seed mix for most roadside seeding work.
Crown Vetch Mix	A blend of a hardy legume and a hardy turfgrass. The turfgrass provides control and top growth until the Crown Vetch plants grow and develop after several seasons. Crown Vetch produces a mass of purple flowers in season and is a vigorous ground cover.	This mix is primarily used to revegetate slope areas when erosion and soil fertility may be a problem. There have been some concerns over its ability to spread and crowd out indigenous growth and its non-native status.
Birdsfoot Trefoil Mix	A blend of another hardy legume and a hardy turfgrass. Very similar growth characteristics to the Crown Vetch mix, except a little slower growing, less vigorous, and Trefoil has masses of yellow flowers in season.	As with Crown Vetch, this mix is primarily used to revegetate slope areas when erosion and soil fertility may be a problem. It is hardier in the north than Crown Vetch and is not as aggressive in growth and habit.
Salt Tolerant Mix	The salt tolerant mix is a blend mixture of several turfgrass species with a proven resistance to salt.	The salt tolerance mix should be specified in areas such as medians, shoulder strips, and shoulder ditches, when salt is thought to be in heavier concentrations.
Lowland Mix	The lowland mix was developed with several species of turfgrasses that grow well in low-lying wet areas.	The lowland mix should be specified along waterbody edges in low-lying areas when light seasonal flooding is a possibility.
Acidic Soil Mix	The acidic soil mix was developed to provide adequate vegetative cover on areas of low fertility and high acidity.	The acidic soil mix should be used in areas of low fertility, medium to high acidity, and in the northern areas of the province.
Northern Ontario Mix	This mix is designed to suit the limited topsoil conditions and acidity of Northern Ontario sites.	Old field should be selected when there will be fallow areas left alone with little or no maintenance, no mowing, and the area will be required to be self-sustaining. More suitable in rural areas than urban or suburban.



**APPENDIX TABLE A-2  
Seeding Cover Application Types**

<b>Cover Application Types</b>	<b>Cover Type Attributes</b>	<b>Selection Criteria</b>
Straw	Chopped straw is applied to the seeded area via a straw mulch blower and is coated with a tackifier or crimped to hold it together. A time-tested method of providing cover and protection for germinating seedlings, as well as short-term erosion control.	One of the default cover types. Straw has the advantage of being relatively cheap and providing good coverage. Straw cover application requires another piece of equipment and a labour intensive second application to properly apply the cover material.
Hydraulic Mulch	Hydraulic mulch is a processed fibre of wood, straw, cotton, cellulose pulp, or any combination of these materials. Hydraulic mulches provide a uniform absorptive mat that allows moisture to penetrate into the underlying soil, while providing cover for the germinating seed.	Hydraulic mulch is the other default mulch. It has the advantage of being easy to apply, using the same equipment when applying seed and fertilizer. It is low-cost and low-labour. Hydraulic mulch does not give the same degree of protection to the germinating grass as straw does. During extremes of temperature and moisture, it will not perform as well as straw or other higher levels of erosion control.
Erosion Control Blanket (ECB)	ECBs are a family of products that are supplied in rolls. They are unrolled over the seeded earth area and stapled in place. ECBs provide a higher level of erosion control and protection for germinating seedlings. ECBs are machine woven mats with a variety of materials sandwiched between the two woven layers. Materials can be wood, coco or cotton fibre, straw, or any combination depending upon manufacturer.	ECBs should be specified in the contract preparation stage and not during construction. ECBs are specified on a project when erosion of soil slopes or soil ditches is expected to be a problem. ECBs have an advantage over hydraulic mulch in that the blanket is firmly attached to the underlying soil by staples, it is longer lasting, and provides a superior growth medium for seedlings. It is more expensive and improper installation can result in poor end results leading to surface erosion.
Bonded Fibre Matrix (BFM)	BFM is a hydraulically applied product made of wood, cotton, or cellulose pulp fibres. The fibres are bonded together by various means including mineral bonding agents or organic tackifiers. When applied, the BFM forms a viscous material that upon drying creates a high strength, porous, and erosion resistant mat.	BFMs are applied like hydraulic mulches and have a great similarity to hydraulic mulches, except BFMs have greater erosion resistance and create a thicker, firmer mat. BFMs should be specified when erosion of soil slopes or soil ditches is expected to be a problem and when hydraulic seeders can get access. BFMs are specified in the design stage and have also been substituted for ECBs during construction, although usually at the Contractor's request.
Fibre Reinforced Matrix (FRM)	FRM is a hydraulically applied product made of pasteurized wood fibers, dispersible synthetic fibers, and soil-bonding agents. When applied, the FRM forms a viscous material that dries quickly and locks up within one hour. Upon drying the product provides increased flexibility and loft for impact resistance, air circulation, and moisture retention that promotes seed germination and plant growth.	FRMs are applied like hydraulic mulches and have a great similarity to hydraulic mulches, except differ from BFMs in that they cure within two hours, have superior cover factor and vegetation establishment. The functional longevity is up to 18 months. Due to the thickness, the product provides superior terrain protection, even during hard rains. This product can be used for any slopes, including 1H:1V.



## CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES

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### APPENDICES

805-A	Commentary
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#### 805.01 SCOPE

This specification describes the requirements for the installation, maintenance, and removal of temporary erosion and sediment control measures.

##### 805.01.01 Specification Significance and Use

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **805.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **805.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 206	Grading
OPSS 517	Dewatering
OPSS 804	Seed and Cover

### **Ontario Provincial Standard Specifications, Material**

OPSS 1004	Aggregates - Miscellaneous
OPSS 1801	Corrugated Steel Pipe Products
OPSS 1840	Non-Pressure Polyethylene Plastic Pipe Products
OPSS 1860	Geotextiles

### **Canadian and Provincial Statutes**

Ontario Water Resources Act, R.S.O. 1990, c. 0.40

### **Canadian General Standards Board (CGSB)**

148.1 No 7.3-92	Methods of Testing Geosynthetics and Geomembranes - Grab Tensile Test for Geotextiles
148.1 No 10-94	Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size

## 805.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Diversions Ditch** means a temporary channel to intercept and convey overland flow away from areas of disturbed or erodible soil and to minimize erosion of slopes from sheet flow.

**Earth** means as defined in OPSS 206.

**Erosion** means the physical removal or detachment of soil particles from an earth surface, followed by the transport of detached particles to another location by the action of a mobile agent including rain, flowing water, wind, equipment and vehicles.

**Fibre Roll** means an assembled or commercially available flexible, tubular structure that provides sediment control and may provide run-off filtration and includes wattles, filter socks and filter berms.

**High Water Level** means the highest point on the bank or floodplain of a waterbody where the water level reaches during high flow events or periods.

**Riparian Vegetation** means vegetation within 30 m of a waterbody.

**Sediment** means soil particles detached from an earth surface by erosion.

**Waterbody** means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

**Waterbody Bank** means the slope on or adjacent to a waterbody from the normal water level to the top of slope.

**Watercourse** means a stream, creek, river, or channel including ditches, in which the flow of water is permanent, intermittent, or temporary.

## 805.05 MATERIALS

### 805.05.01 Straw and Straw Bales

Straw shall be either wheat or oat straw.

Straw bales shall be dry and firm, be tied tightly in at least two places, show no evidence of straw or tie decay, and be free of sediment. They shall be of agricultural, rectangular formation and dimensions, as specified in the Contract Documents.

### 805.05.02 Geosynthetics

#### 805.05.02.01 Geotextile

Geotextile shall be free of holes, tears, and punctures.

#### 805.05.02.02 Silt Fence Geotextile

Geotextile for silt fence shall be according to OPSS 1860, Table 3.

Geotextile for silt fence may be separate from the stakes used to install it as a sediment barrier.

**805.05.02.03 Berm Barrier and Rock Flow Check Dam Geotextile**

Geotextile for berm barriers and rock flow check dams shall be a woven, Class II geotextile according to OPSS 1860. The filtration opening size (FOS) shall be no greater than 300 µm.

**805.05.02.04 Turbidity Curtain Geosynthetic**

Turbidity curtain geosynthetics shall have a grab tensile strength of at least 990 N, meeting CAN/CGSB 148.1, No. 7.3 and be one of geotextile or geomembrane.

Geotextile shall be a woven material. The filtration opening size (FOS) shall be no greater than 300 µm, meeting CAN/CGSB 148.1, No. 10.

Geomembrane shall be a low-permeability synthetic material or a geotextile impregnated with elastomeric spray.

**805.05.02.05 Filter Bags**

Geotextile for filter bags shall be non-woven, polypropylene, Class I according to Table 1 of OPSS 1860 unless otherwise specified in the Contract Documents.

**805.05.03 Plastic Sheeting**

Plastic sheeting used to wrap berm barriers or other sediment control measures shall be 6 mm polyethylene of maximum available width.

**805.05.04 Stakes**

Stakes shall be of sufficient strength and length to satisfy control measure installation, performance and maintenance requirements.

**805.05.05 Control Measure Support**

Control measure support for heavy-duty silt fence barrier shall be a separate product or one bonded to silt fence geotextile and be either plastic snow fence mesh, 0.81 mm diameter galvanized wire mesh or 1.63 mm diameter galvanized steel fence with a 5 cm by 10 cm weave and a 0.91 m height.

When a heavy-duty silt fence barrier is installed using a product manufactured with the control measure support bonded to the geotextile it shall be installed with the geotextile on the upstream side or front of the control measure support.

**805.05.05.01 Posts**

Posts to support heavy duty wire-backed silt fence barriers shall be metal T-posts. Metal ties shall be used to secure the silt fence to the metal T-posts.

**805.05.06 Berm Barriers**

Berm barriers shall be constructed using earth, sand, gravel, brush or compost.

**805.05.07 Sandbags**

Sandbags shall be made from heavy gauge plastic, agricultural burlap, or silt fence geotextile. Heavy gauge plastic shall contain stabilizers or inhibitors resistant to deterioration by ultraviolet radiation. Sandbags shall be filled with clean sand, 19 mm gravel or 6 mm pea gravel, containing no silt or clay.

**805.05.08                      Fibre Rolls**

Fibre rolls shall be of a consistent internal thickness with even fibre distribution throughout the roll.

Fibre rolls shall be covered on the outside with an open-weave, biodegradable and photodegradable mesh or netting that securely contains the fibres within the rolls.

Fibre rolls shall be filled with 100% organic, biodegradable material such as shredded straw, wood fibres or compost and may contain seed.

**805.05.09                      Turbidity Curtain Hardware**

**805.05.09.01                  Floatation**

Turbidity curtain floatation shall be a material that has sufficient buoyancy to provide the curtain with continuous support, and a minimum of freeboard as specified in the Contract Documents.

**805.05.09.02                  Load Lines**

Turbidity curtain load lines shall be 8 mm diameter steel cable or 19 mm diameter nylon or polypropylene rope.

**805.05.09.03                  Ballast**

Turbidity curtain ballast shall be 8 mm steel chain.

**805.05.09.04                  Anchors**

Turbidity curtain anchors shall be mushroom or kedge anchors with a minimum mass of 34 kg for firm mud bottoms or self-burying anchors with a minimum mass of 5 kg for sandy bottoms.

**805.05.09.05                  Mooring Buoys**

Turbidity curtain mooring buoys shall have provision for the mooring line to be securely attached and be sufficiently buoyant to remain afloat under normal load conditions.

**805.05.09.06                  Mooring Lines**

Turbidity curtain mooring lines shall be 19 mm diameter nylon or polypropylene rope.

**805.05.09.07                  Adjustment Lines**

Turbidity curtain adjustment lines shall be 13 mm diameter nylon or polypropylene rope.

**805.05.10                      Rock**

Rock for rock flow check dams shall be according to the requirements for rip-rap and gabion stone according to OPSS 1004.

**805.05.11                      Corrugated Pipe**

Corrugated pipe slope drains shall be non-perforated, corrugated steel pipe according to OPSS 1801 or polyethylene plastic pipe according OPSS 1840. Pipe diameter shall be as specified in the Contract Documents.

**805.05.12 End Sections**

End sections for the inlet and outlet of slope drains shall be according to OPSS 1801, regardless of the material type of the pipe used.

**805.05.13 Erosion Control Blankets**

Erosion control blankets for diversion ditches shall be as specified in OPSS 804.

**805.07 CONSTRUCTION**

**805.07.01 Operational Constraints**

**805.07.01.01 Retention of Riparian Vegetation**

The area over which vegetation is removed on site shall affect no more than one third (1/3) of the total woody vegetation in the right-of-way within 30 m of the high water level of any waterbody unless otherwise specified in the Contract Documents.

**805.07.01.02 Protection of Stockpiled Materials**

All stockpiles of erodible construction materials and excess or surplus materials shall be protected from erosion and sediment transport within 48 hours of being built unless otherwise specified in the Contract Documents.

**805.07.01.03 Dewatering**

Dewatering effluent shall be controlled to prevent passage of sediment into waterbodies and other sensitive environmental features as specified in the Contract Documents or onto adjacent properties. Discharge of dewatering effluent to sediment traps for dewatering shall be controlled to avoid exceeding trap capacity and to prevent scour and washout.

Discharge of water from sediment traps for dewatering shall be according to OPSS 517.

**805.07.01.04 Slope Drains**

When slope drains are specified in the Contract Documents, the slope drain and associated berm barrier shall be constructed in the same day.

**805.07.01.05 Turbidity Curtains and Cofferdams**

Equipment shall not be operated in a waterbody outside a turbidity curtain or cofferdam other than hand held equipment or boats.

**805.07.01.06 Construction and Removal of Measures**

The construction and removal times for temporary erosion and sediment control measures shall be as specified in the Contract Documents.

**805.07.02 Light-Duty Sediment Barriers, General**

Light-duty sediment barriers are light-duty straw bale barriers, light-duty silt fence barriers, or light duty fibre roll barriers.

Light-duty sediment barriers shall be constructed as specified in the Contract Documents.

Light-duty sediment barriers shall not be installed in or across waterbodies.

When the Light-Duty Sediment Barriers item is specified in the Contract Documents, any light-duty sediment barriers may be used. When a specific light-duty sediment barrier is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Light-duty sediment barriers shall include protection placed against the downslope side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

#### **805.07.02.01 Light-Duty Straw Bale Barriers**

Light-duty straw bale barriers shall be constructed as specified in the Contract Documents.

When specified to be installed around catch basins, straw bales shall be placed completely around catch basins and ditch inlets without gaps. When a double row of straw bales is specified in the Contract Documents, the straw bales shall be placed such that the joints between the straw bales of each row are not in-line with the joints of the straw bales of the adjacent row.

Stakes securing the bales shall be driven through the bales without breaking the bale ties or otherwise disturbing bale firmness and shape.

Maintenance shall include the replacement of each bale at intervals not exceeding 45 Days.

#### **805.07.02.02 Light-Duty Silt Fence Barriers**

Light-duty silt fence barriers shall be constructed as specified in the Contract Documents.

Light-duty silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Light-duty silt fence barriers shall be installed within a trench excavated along the contour of the ground such that the elevation of the above ground portion of the fence is the same along its entire length except at the ends. Light-duty silt fence barriers shall be installed without breaks or gaps along their entire length. Light-duty silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another light-duty silt fence barrier shall be installed as specified in the Contract Documents.

The geotextile shall be attached firmly, without sagging, to the upslope side of the stakes. Stakes shall be spaced to ensure the geotextile remains vertical. Where the geotextile is joined to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to the stakes using cable ties or soft wire at the top of the geotextile only. The geotextile shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

When geotextile is supplied without stakes attached, the geotextile shall be installed into the trench in the ground first, the stakes shall be driven into the ground behind the geotextile, and the geotextile shall be attached to the upslope side of the stakes using cable ties or soft wire at the top of geotextile only.

#### **805.07.02.03 Light-Duty Fibre Roll Barriers**

Light-duty fibre roll barriers shall be sized and constructed as specified in the Contract Documents.

Light-duty fibre roll barriers shall be installed along the contour of the ground into trenches that have been excavated into the soil perpendicular to the slope face to a depth of approximately one half the roll diameter and width across the width of the slope.



Any rills and gullies shall be filled in where light-duty fibre roll barriers are to be installed. Light-duty fibre roll barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another light-duty fibre roll barrier shall be installed tightly butted against the first one.

Light-duty fibre roll barriers shall be installed so that their base is in continuous contact with the underlying soil along their entire length without gaps and angled upslope at each end run in a "J" pattern. The ends of adjacent fibre roll segments shall be tightly butted against each other and shall not be overlapped vertically or horizontally.

A metal bar shall be used to make pilot holes perpendicular to the slope face through the centre of the fibre rolls as specified in the Contract Documents. Pilot holes shall also be made at the ends of each fibre roll segment angled towards the next abutting fibre roll to hold adjacent rolls together.

Wooden stakes shall be driven into the pilot holes as specified in the Contract Documents.

Soil excavated from the trenches shall be placed along the upslope side of the fibre rolls and compacted into the front of the trench to minimize possible undermining by runoff.

The soil on the upslope and downslope sides of the fibre rolls shall be seeded according to OPSS 804.

### **805.07.03 Heavy-Duty Sediment Barriers, General**

Heavy-duty sediment barriers are heavy-duty silt fence barriers, heavy-duty wire-backed silt fence barriers, berm barriers, or sandbag barriers.

Heavy-duty sediment barriers shall be constructed as specified in the Contract Documents, without gaps and without undermining to prevent sediment passage through, under, or around the barrier.

When heavy-duty sediment barriers are specified in the Contract Documents, the Contractor has the option to select any of the heavy-duty sediment barriers or any combination of them. When a specific heavy-duty sediment barrier is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Heavy-duty silt fence barriers shall include control measure support placed against the downstream side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

#### **805.07.03.01 Heavy-Duty Silt Fence Barriers**

Heavy-duty silt fence barriers shall be constructed as specified in the Contract Documents.

Heavy-duty silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Heavy-duty silt fence barriers shall be installed within a trench excavated along the contour of the ground such that the elevation of the bottom of the fence is the same along its entire length except at the ends. Heavy-duty silt fence barriers shall be installed without breaks or gaps along their entire length. Heavy-duty silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another heavy-duty silt fence barrier shall be installed as specified in the Contract Documents.

The geotextile shall be attached firmly to the upstream side of the control measure support and the stakes. Stakes shall be spaced to ensure the geotextile and the control measure support remains vertical. Where the geotextile or the control measure support is joined to itself to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to stakes using wire ties

at the top of the geotextile or the control measure support only. The geotextile and control measure support shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

When geotextile is supplied without the control measure support or stakes attached, the control measure support shall be installed into the trench in the ground first, the geotextile shall be installed into the trench on the upslope side of the control measures support, the stakes shall be driven into the ground behind the geotextile and the control measure support, and the geotextile and control measure support shall be attached to the stakes using wire ties at the top of the geotextile and control measure support and only.

#### **805.07.03.02            Heavy-Duty Wire-Backed Silt Fence Barriers**

Heavy-duty wire-backed silt fence barriers shall be constructed as specified in the Contract Documents.

Heavy-duty wire-backed silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Heavy-duty wire-backed silt fence barriers shall be installed in a trench excavated along the contour of the ground such that the elevation of the bottom of the fence is the same along its entire length except at the ends. Heavy-duty wire-backed silt fence shall be installed without breaks or gaps along their entire length. Heavy-duty wire-backed silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another heavy-duty wire-backed silt fence barrier shall be installed as specified in the Contract Documents.

The wire control measure support shall be installed into the trench in the ground. The geotextile shall be installed into the trench on the upslope side of the wire control measure support. T-posts shall be installed into the ground behind the geotextile and wire control measure support and spaced to ensure the geotextile and wire control measure support remain vertical. The geotextile and the wire control measure support shall be attached securely to the T-posts using wire ties at the top of the geotextile and wire control measure support only. Where the geotextile or the wire control measure support is joined to itself to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to T-posts using wire ties at the top of the geotextile or wire control measure support only. The geotextile wire control measure support shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

#### **805.07.03.03            Berm Barriers**

Berm barriers shall be constructed and wrapped in geotextile or plastic sheeting as specified in the Contract Documents. The geotextile or plastic sheeting shall be secured to the ground.

#### **805.07.03.04            Sandbag Barriers**

Sandbags shall be securely tied at the top.

Sandbag barriers shall be constructed as specified in the Contract Documents

Sandbags within each row shall be placed with the sides of the bags butted tightly against one another without gaps. The ends of sandbags in adjacent rows shall be butted tightly against one another without gaps.

When sandbag barriers are constructed on earth surfaces, the trench into which the sandbags are placed shall be backfilled around the sandbags to existing grade and compacted.

When sandbag barriers are to be constructed on sod, erosion control blanket, existing turf, or bedrock, they shall be placed so there are no gaps between the sandbags and the underlying surface.

Sandbag barriers shall be maintained with undamaged bags that are firmly seated.

#### **805.07.04 Fibre Roll Grade Breaks**

Fibre roll grade breaks shall be constructed as specified in the Contract Documents.

Fibre rolls shall be installed horizontally starting from the toe of the slope and working up to the top of the slope. Any rills and gullies on the slope face shall be filled in as the fibre rolls are installed.

Fibre rolls shall be installed along the contour of the ground into trenches that have been excavated into the soil perpendicular to the slope face and width across the slope.

Fibre rolls shall be installed so that their base is in continuous contact with the underlying soil along their entire length without gaps and angled upslope at each end run in a "J" pattern. The ends of adjacent fibre roll segments shall be tightly butted up against each other and shall not be overlapped vertically or horizontally.

A metal bar shall be used to make pilot holes perpendicular to the slope face through the centre of the fibre rolls as specified in the Contract Documents. Pilot holes shall also be made at the ends of each fibre roll segment angled towards the next abutting fibre roll to hold adjacent rolls together.

Wooden stakes shall be driven into the pilot holes perpendicular to the slope face to secure the fibre rolls to the slope along their entire length. Additional stakes shall be driven into the fibre rolls along the downslope side at every grade change or if soils are very loose and uncompacted or the slope is steep.

Soil excavated from the trenches shall be placed along the upslope side of the fibre rolls and well compacted into the front of the trench to minimize possible undermining by runoff.

The soil on the upslope and downslope sides of the fibre rolls shall be seeded as specified in the Contract Documents.

#### **805.07.05 Flow Check Dams - General**

Flow check dams are straw bale flow check dams, fibre roll flow check dams, sandbag flow check dams, or rock flow check dams.

Flow check dams shall be constructed as specified in the Contract Documents such that the spillway level of the downstream flow check dam is the same as the base of the upstream flow check dam when they are specified in series. Flow check dams shall be constructed without gaps and without undermining to prevent sediment passage through, under, or around the flow check dam.

When the Flow Check Dams item is specified in the Contract Documents, any of the flow check dams or any combination of them may be used. When a specific flow check dam is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Flow check dams shall include protection placed against the downstream side at the lowest point of the flow check dam so that any overflow of the flow check dam is prevented from causing soil scour and erosion.

#### **805.07.05.01 Straw Bale Flow Check Dams**

Straw bale flow check dams shall be constructed as specified in the Contract Documents and shall be replaced every 45 days.

**805.07.05.02                      Fibre Roll Flow Check Dams**

Fibre roll flow check dams shall be constructed as specified in the Contract Documents.

**805.07.05.03                      Sandbag Flow Check Dams**

Sandbag flow check dams shall be constructed as specified in the Contract Documents.

**805.07.05.04                      Rock Flow Check Dams**

Rock flow check dams shall be constructed as specified in the Contract Documents.

**805.07.06                          Sediment Traps**

Sediment traps shall be constructed as specified in the Contract Documents to prevent sediment passage from the upstream to the downstream side of the trap and so that the majority of the sediment is collected in the excavated basin.

Sediment traps shall be constructed as a single control measure consisting of an excavated basin and a rock flow check dam.

A temporary fence shall be erected around the sediment trap to restrict public access.

**805.07.07                          Slope Drains**

Slope drains shall be constructed as specified in the Contract Documents.

Slope drains shall be constructed as a single control measure consisting of a corrugated pipe, two end sections including an inlet and an outlet, and a sediment trap constructed at the outlet end of the pipe.

The pipe inlet shall be placed through a berm barrier in such a manner that flow is directed to the pipe inlet without scouring of the berm. The toe plate of the inlet end section shall be fully imbedded into the ground surface.

Pipes shall be maintained in place without gaps and without undermining so that water is conveyed from the upstream side of the berm and collected in the sediment trap.

**805.07.08                          Diversion Ditches**

Diversion ditches shall be constructed as specified in the Contract Documents.

When diversion ditches are specified to be lined with rolled erosion control blanket along their entire length it shall be according to OPSS 804.

Flow check dams shall be installed at regular intervals along the entire length of diversion ditches as specified in the Contract Documents.

Where diversion ditches are specified to be lined with rip-rap or granular it shall be according to OPSS 1004.

**805.07.09                          Sediment Traps for Dewatering**

Sediment traps for dewatering shall be constructed as specified in the Contract Documents.

Sediment traps for dewatering shall be constructed a minimum of 30 m away from waterbodies or as far away as practicable from the top of the bank of any waterbody.

The shape of the excavated basin may be varied to suit the characteristics of the area surrounding it.

The sediment barrier and rock flow check dam shall be constructed as specified in the Contract Documents.

Construction of the sediment barrier shall be according to the requirements for light-duty sediment barriers with the following exceptions:

- a) End runs are not required.
- b) The rock flow check dam shall be located at the low point of the light-duty sediment barrier.

A temporary fence shall be erected around the sediment trap to restrict public access.

Discharge of water from sediment traps for dewatering shall be according to OPSS 517.

#### **805.07.10 Filter Bags**

Filter bags, hoses and pumps shall be sized appropriately to the volume as specified in the Contract Documents of water to be filtered. Bags shall have a FOS as specified in the Contract Documents.

Filter bags shall be situated in a vegetated area or placed on a permeable surface on a slight slope with the opening of the bag facing upslope a minimum of 30 m away from waterbodies or as far as practicable from the top of the bank of any waterbody.

The opening of the filter bag shall be securely attached with mechanical connections to the discharge hose using commercially available hose couplers and placed in the retention facility to be dewatered.

Discharge of water from filter bags shall be according to OPSS 517.

#### **805.07.11 Turbidity Curtains**

Turbidity curtains shall be constructed as specified in the Contract Documents. Turbidity curtains shall be free of tears and gaps, and the bottom edge of the curtain shall be continuously in contact with the waterbody bed so that sediment passage from the enclosed area is prevented.

Turbidity curtains shall be constructed according to the following:

- a) Breaks may be made in the lower sleeve to facilitate pulling of the ballast, provided they are a maximum 100 mm in size and spaced at minimum 3 m intervals.
- b) Where turbidity curtain geosynthetic is joined to provide a continuous run, the sections shall be connected to provide a continuous seal to prevent the escape of turbid water between the sections.
- c) The turbidity curtain shall be of sufficient width to account for water depth and wave action.
- d) The turbidity curtain shall be prepared for installation by furling and tying securely with furling ties every 1.5 m for the entire length of the curtain.
- e) Anchor locations shall be established as necessary to maintain the turbidity curtain in place and functioning.

The sequence of installation shall be according to the following:

- a) Tie-downs shall firmly anchor the turbidity curtain to the shoreline.

- b) One end of the furled curtain shall be firmly attached to the upstream tie-down.
- c) The furled curtain shall be launched and placed.
- d) The other end of the furled curtain shall be attached to the downstream tie-down.
- e) Each anchor shall be attached to the turbidity curtain load line with a mooring line.
- f) Mooring buoys shall be attached to the mooring line at a distance of 1 m from the load line to keep the turbidity curtain in place at locations where it changes direction.
- g) The furling ties shall be released to allow the turbidity curtain ballast to sink to its maximum depth.
- h) The location and depth of the ballast shall be adjusted as necessary using the adjustment lines.

Equipment is permitted in the working area enclosed by the turbidity curtain.

Folds in the turbidity curtain that form next to the floatation collar shall be regularly monitored and cleared of collected sediment.

#### **805.07.12 Cofferdams**

Cofferdams shall be constructed as specified in the Contract Documents to:

- a) Isolate the working area from the waterbody.
- b) Prevent the release of sediment and debris into the surrounding waterbody.

Equipment is permitted in the working area enclosed by the cofferdam.

#### **805.07.13 Monitoring**

All temporary erosion and sediment control measures shall be monitored to ensure they are in effective working order. Monitoring shall be once a week, at minimum, prior to any forecast rain event and following any rain event.

#### **805.07.14 Maintenance**

All temporary erosion and sediment control measures constructed under this specification shall be maintained in an effective, functioning, stable condition.

#### **805.07.15 Sediment Removal**

The work shall consist of the removal and management of accumulated sediment.

Sediment that is accumulated by the temporary erosion and sediment control measures shall be removed in a manner that avoids escape of the sediment to the downstream side of the control measure and avoids damage to the control measure. Sediment shall be removed to the level of the grade existing at the time the control measure was constructed and be according to the following:

- a) For light-duty sediment barriers and flow check dams, accumulated sediment shall be removed once it reaches the lesser of the following:
  - i. A depth of one-half the effective height of the control measure. For flow check dams, the effective height shall be determined relative to the lowest point of the flow check dam.
  - ii. A depth of 300 mm immediately upstream of the control measure.

- b) For heavy-duty sediment barriers, sediment traps, and sediment traps for dewatering, accumulated sediment shall be removed once it reaches one-half the effective height or depth of the control measure.
- c) For all control measures, accumulated sediment shall be removed as necessary to perform maintenance repairs.
- d) Accumulated sediment shall be removed immediately prior to the removal of the control measure.

**805.07.16 Control Measure Removal**

Ditch, permanent slope, and any other embankment cover specified elsewhere in the Contract Documents to be placed within the area controlled by the temporary erosion and sediment control measure shall be in place and established prior to the removal of such control measure.

Temporary erosion and sediment control measures shall be removed and associated excavations backfilled and compacted when the measures are no longer required.

Temporary erosion and sediment control measures shall be removed in a manner that:

- a) Prevents entry of equipment, other than hand-held equipment or boats, to any waterbody.
- b) Prevents release of sediment and debris to any waterbody.

Prior to removal of the in-water control measures, the area enclosed by turbidity curtains and cofferdams shall be cleaned of all debris. For cofferdams, accumulated sediment shall be removed prior to removal of the sediment control measure.

Any seeding and mulching, temporary cover, sod, other surface application, or original turf cover disturbed by removal or backfilling of erosion and sediment control measures and removal of accumulated sediment, shall be brought to final grade and restored as specified in the Contract Documents.

**805.07.17 Management of Excess Material**

Management of excess material shall be according to the Contract Documents.

**805.07.18 Protection of Waterbodies and Waterbody Banks**

Protection of waterbodies and waterbody banks shall be as specified in the Contract Documents.

**805.09 MEASUREMENT FOR PAYMENT**

**805.09.01 Actual Measurement**

- 805.09.01.01**
- Light-Duty Sediment Barriers**
  - Light-Duty Straw Bale Barriers**
  - Light-Duty Silt Fence Barriers**
  - Light-Duty Fibre Roll Barriers**
  - Heavy-Duty Sediment Barriers**
  - Heavy-Duty Silt Fence Barriers**
  - Heavy-Duty Wire-Backed Silt Fence Barriers**
  - Berm Barriers**
  - Sandbag Barriers**
  - Fibre Roll Grade Breaks**

Measurement shall be the length in lineal metres from end to end of the barrier constructed, maintained, and removed, following the contours of the ground.

- 805.09.01.02**
- Flow Check Dams**
  - Straw Bale Flow Check Dams**
  - Fibre Roll Flow Check Dams**
  - Sandbag Flow Check Dams**
  - Rock Flow Check Dams**

For measurement purposes, a count shall be made of the flow check dams constructed, maintained, and removed.

- 805.09.01.03**
- Sediment Traps**
  - Slope Drains**
  - Diversion Ditches**
  - Sediment Traps for Dewatering**
  - Filter Bags**

For measurement purposes, a count shall be made of the number of sediment traps, slope drains, diversion ditches, sediment traps for dewatering and filter bags constructed or installed, maintained, and removed. Component parts shall not be counted separately for payment.

- 805.09.01.04**
- Turbidity Curtains**

Measurement of turbidity curtain shall be made in lineal metres along its length from end to end between tie-downs for each turbidity curtain installed, maintained, and removed.

- 805.09.01.05**
- Cofferdams**

For measurement purposes, a count shall be made of the number of cofferdams constructed, maintained, and removed.

- 805.09.01.06**
- Sediment Removal**

Measurement shall be as specified in the Contract Documents by the volume of sediment excavated in cubic meters or by the number of hours required for excavation of sediment.

- 805.09.02**
- Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.



**805.10 BASIS OF PAYMENT**

- 805.10.01**
- Light-Duty Sediment Barriers - Item**
  - Light-Duty Straw Bale Barriers - Item**
  - Light-Duty Silt Fence Barriers – Item**
  - Light-Duty Fibre Roll Barriers - Item**
  - Heavy-Duty Sediment Barriers - Item**
  - Heavy-Duty Silt Fence Barriers – Item**
  - Heavy-Duty Wire-Backed Silt Fence Barriers – Item**
  - Berm Barriers - Item**
  - Sandbag Barriers - Item**
  - Fibre Roll Grade Breaks – Item**
  - Flow Check Dams - Item**
  - Straw Bale Flow Check Dams - Item**
  - Fibre Roll Flow Check Dams - Item**
  - Sandbag Flow Check Dams - Item**
  - Rock Flow Check Dams – Item**
  - Sediment Traps - Item**
  - Slope Drains – Item**
  - Diversion Ditches - Item**
  - Sediment Traps for Dewatering – Item**
  - Filter Bags - Item**
  - Turbidity Curtains - Item**
  - Cofferdams - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material required to do the work.

Progress payments for the temporary erosion and sediment control measures shall be made as follows:

- a) 30% for initial construction.
- b) 50% for maintenance.
- c) 20% for removal.

**805.10.02 Sediment Removal - Item**

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract Documents do not have a separate item for sediment removal, payment at the Contract price for the appropriate tender item for the installation of the sediment control measures shall be full compensation for all labour, Material, and Equipment to do the work of sediment removal.

**Appendix 805-A, November 2021  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Installation and removal times for temporary erosion and sediment control measures. (805.07.01.06)
- Grading requirements for control measure removal. (805.07.16)
- Sediment removal measurement for payment. (805.09.01.06)

The designer should determine the need for barrier installation. The desirable slope grade is maximum 5%. (805.07.02 and 805.07.03)

The designer should determine the following and, if they are required, the requirements should be included in the Contract Documents:

- Sensitive environmental features. (805.07.01.03)
- The need for a specific light-duty sediment barrier. Where the light-duty sediment barrier is to be built using fibre rolls, the diameter of the fibre rolls to be used and whether and how they may be stacked vertically. (805.07.02)
- The type of seed mix to be applied to the upslope and downslope sides of fibre roll grade breaks. (805.07.02.03)
- The need for a specific heavy-duty sediment barrier. Where the heavy-duty sediment barrier is to be built using fibre rolls, the diameter of the fibre rolls to be used and whether and how they may be stacked vertically. (805.07.03)
- The need for wire backing for a heavy-duty silt fence barrier. (805.07.03.02)
- The need for fibre roll grade breaks and the number, diameter and spacing of fibre rolls required. (805.07.04)
- The need for a specific flow check dam, the number of flow check dams in series required and the spacing of the flow check dams. (805.07.05)
- The need for a sediment trap(s). When a sediment trap is to be constructed in a ditch the outside edge shall be sized to extend beyond the base of the ditch. (805.07.06)
- The need for a slope drain(s). (805.07.07)

Identify the need for a diversion ditch(s). Design dimensions and direction of flow along contour of ground. Outlet details including scour protection and sediment control. The need for, type and number of flow check dam(s), and type of erosion control lining. (805.07.08)

- The need for a sediment trap(s) for dewatering. Ensure that sediment traps for dewatering are sized appropriately for the catchment area and that there is enough space available to construct them. (805.07.09)
- The need for filter bags, and the type, Class and filtration opening size (FOS) of geotextile to be used. (805.07.10)
- Appropriate volume of water to be filtered. (805.07.10)
- The need for a turbidity curtain(s). (805.07.11)
- The need for and design of a cofferdam(s). (805.07.12)
- Whether sediment removal is to be measured by volume or time. (805.09.01.06)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

### **Related Ontario Provincial Standard Drawings**

OPSD 219.100	Light-Duty Straw Bale Barrier
OPSD 219.110	Light-Duty Silt Fence Barrier
OPSD 219.120	Light-Duty Fibre Roll Barrier
OPSD 219.130	Heavy-Duty Silt Fence Barrier
OPSD 219.131	Heavy-Duty Wire-Backed Silt Fence Barrier
OPSD 219.150	Sandbag Barrier
OPSD 219.160	Fibre Roll Grade Breaks
OPSD 219.180	Straw Bale Flow Check Dam
OPSD 219.191	Fibre Roll Flow Check Dam
OPSD 219.200	Sandbag Flow Check Dam
OPSD 219.210	Temporary Rock Flow Check Dam V-Ditch
OPSD 219.211	Temporary Rock Flow Check Dam Flat Bottom Ditch
OPSD 219.220	Sediment Trap In Ditch
OPSD 219.230	Temporary Slope Drain For Sediment Trap
OPSD 219.231	Temporary Berm Barrier
OPSD 219.240	Sediment Trap for Dewatering
OPSD 219.260	Turbidity Curtain
OPSD 219.261	Turbidity Curtain Seam Detail



**MATERIAL SPECIFICATION FOR  
AGGREGATES - MISCELLANEOUS**

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**1004.01 SCOPE**

This specification covers material requirements for aggregates for use as clear stone, granular sheeting, mortar sand, gabion stone, rip-rap, rock protection, truck arrester bed aggregate, and winter sand.

**1004.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **1004.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1004.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Material**

OPSS 1001     Aggregates - General  
OPSS 1010     Aggregates - Base, Subbase, Select Subgrade, and Backfill Material

### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:

LS-601     Materials Finer than 75  $\mu\text{m}$  Sieve in Mineral Aggregates by Washing  
LS-602     Sieve Analysis of Aggregates  
LS-604     Relative Density and Absorption of Coarse Aggregate  
LS-607     Percent Crushed Particles in Processed Coarse Aggregate  
LS-608     Percent Flat and Elongated Particles in Coarse Aggregate  
LS-610     Organic Impurities in Concrete Sands  
LS-614     Freezing and Thawing of Coarse Aggregate  
LS-616     Petrographic Analysis of Fine Aggregate  
LS-618     Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus  
LS-619     Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus  
LS-625     Guidelines for Sampling of Aggregate Materials  
LS-703/704     Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## ASTM International

C87/C87M-17	Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
D6473-15	Standard Test Method for Specific Gravity and Absorption of Rock for Erosion Control

### 1004.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**CCIL** means the Canadian Council of Independent Laboratories.

**Clear Stone** means a graded aggregate intended for use in drainage, backfill, bedding, and other applications.

**Control Chart** means a graphical method used to monitor the central tendency and the variability of material characteristic in order to control production.

**Deleterious Material** means materials that include, but not limited to, the following: wood, clay brick, clay tile, plastic, gypsum, gypsum plaster, wallboard, roots, and all other organic material.

**Duplicate Samples** means two samples taken at the same time and location, one to be used for quality assurance testing and the other for referee testing.

**Gabion Stone** means a graded fractured rock aggregate intended for use in gabion baskets, gabion mats andrevet (gabion) mattresses.

**Granular Sheeting** means a graded granular aggregate material intended for use as a protective surface layer on erodible soil slopes.

**Mortar Sand** means a fine aggregate intended for application in hydraulic cement-based mortars.

**Nominal Maximum Size** means the largest sieve in the applicable specification upon which material is permitted to be retained.

**Physical Property** means an inherent attribute or feature of an aggregate material. Tests are carried out to determine an aggregate's resistance to weathering or degradation or both.

**Pit-Run Material** means material excavated directly from an existing bank in a pit and delivered to the job site without further processing, i.e., crushing, screening, washing, and classifying.

**Referee Testing** means testing of a material property or attribute for the purpose of resolving acceptance.

**Rip-Rap** means a well graded, fractured rock or crushed reclaimed concrete intended for use as slope protection in hydraulic channels.

**Rock Protection** means a well graded, fractured rock or crushed reclaimed concrete intended for use as general slope protection.

**Spheroidal Particle** means when the ratio of the greatest dimension in the longitudinal axis compared to the least dimension in a plane perpendicular to the longitudinal axis is less than 2:1.

**Statistical Control** means when all sources of assignable variation have been removed, the variability of the process is confined to probability variation alone,

**Truck Arrester Bed Aggregate** means a single-sized aggregate used in runaway truck lanes to slow and stop the progress of vehicles.

**Winter Sand** means a fine aggregate intended for application to roadways during winter conditions to improve frictional properties of the pavement surface.

## **1004.05 MATERIALS**

### **1004.05.01 General**

Aggregates shall be according to OPSS 1001, unless otherwise specified in this specification.

All aggregate source materials shall be clean, hard, durable particles free of earth, humus, clay or other coatings, clay lumps, shale or shaley partings, and other deleterious materials. Aggregates shall be produced from sands, gravels, cobbles, boulders, or quarried rock. Reclaimed asphalt pavement, reclaimed hydraulic cement concrete, glass, other reclaimed materials, and slag materials shall not be used. When reclaimed materials are permitted by this specification or as specified in the Contract Documents, they shall be homogeneously blended. When reclaimed hydraulic cement concrete is permitted, it shall not contain loose reinforcing material and shall be free of protruding metal.

When a change in the character of the aggregate occurs or when the performance of aggregate that meets the requirements of this specification is found to be unsatisfactory, use of the aggregate shall be discontinued until it can be proven to the satisfaction of the Contract Administrator that the source remains acceptable or can be made acceptable.

Irrespective of compliance or non-compliance with the gradation and physical property requirements of this specification, aggregates may be accepted or rejected on the basis of field performance as determined by the Owner.

### **1004.05.02 Clear Stone**

Clear stone may be 53.0 mm, 19.0 mm Type I, 19.0 mm Type II, 16.0 mm, 13.2 mm, or 9.5 mm and shall meet the physical property requirements shown in Table 1 and the gradation requirements shown in Table 2.

### **1004.05.03 Granular Sheeting**

Granular sheeting shall meet the physical property requirements shown in Table 3 and the gradation requirements shown in Table 4.

### **1004.05.04 Mortar Sand**

Mortar sand shall consist of natural sand, or subject to the approval of the Contract Administrator other inert materials with similar characteristics, or combinations thereof, having hard, strong, durable particles. The sand shall be free from a coating of any deleterious material and free from other deleterious substances.

Mortar sand shall meet the physical property requirements shown in Table 5 and the gradation requirements shown in Table 6.

**1004.05.05 Gabion Stone, Rip-Rap, and Rock Protection**

**1004.05.05.01 General**

Rip-rap, rock protection, and gabion stone shall be produced from crushed or fractured bedrock fragments with 100% fractured faces or crushed from cobbles or boulders greater than 300 mm diameter and shall not deteriorate when exposed to air and water and shall be resistant to deterioration by cycles of wetting, drying, freezing, and thawing.

Reclaimed hydraulic cement concrete may be used in non-watercourse applications.

**1004.05.05.02 Rip-Rap and Gabion Stone**

Rip-rap R-10 and R-50 classifications and gabion stone G-3 and G-10 classifications shall meet the physical property requirements shown in Table 7 and gradation requirements shown in Table 8.

**1004.05.05.03 Rock Protection**

Rock protection shall meet the physical property requirements shown in Table 7 and the gradation requirements shown in Table 8.

**1004.05.06 Truck Arrester Bed Aggregate**

Truck arrester bed aggregate shall be pit-run material meeting the physical property requirements shown in Table 9 and the gradation requirements shown in Table 10. In addition, truck arrester bed aggregate shall meet the following shape requirements:

- a) Rounded particles shall be a minimum of 30% by mass. Rounded particles shall be determined by the procedure given in LS-607, reporting the percentage of rounded particles instead of crushed particles. The test specimen size shall be a minimum of 3,000 g passing the 26.5 mm sieve and retained on the 19 mm sieve.
- b) Spheroidal particles shall be a minimum of 50% by mass. Spheroidal particles shall be determined by the procedure given in LS-608, using a figure-eight calliper in which the ratio of the opening at one end to that at the other end is 2:1 instead of 4:1. The test specimen size shall be a minimum of 3,000 g passing the 26.5 mm sieve and retained on the 19 mm sieve.

**1004.05.07 Winter Sand**

Winter sand shall meet the physical property requirements shown in Table 11 and the gradation requirements shown in Table 12.

**1004.07 PRODUCTION**

**1004.07.01 Aggregate Processing, Handling, and Stockpiling**

Aggregates separated during processing shall be placed in individual stockpiles. Processed aggregates secured from different sources and aggregates from the same source but of different gradations shall be placed in individual stockpiles.

Aggregates that have become mixed with foreign matter of any description or aggregates from different stockpiles that have become mixed with each other shall not be used and shall be immediately removed from the stockpile.



Once a stockpile has been produced, sampled, and tested, no further material may be added to the stockpile. Stockpiles produced, sampled, and tested under the procedure for control chart method may continue to have material added, provided that sampling and testing show that the material in the stockpile is in accordance to this specification and that the process remains in statistical control.

## **1004.08                   QUALITY ASSURANCE**

### **1004.08.01               General**

QA testing may be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of this specification. Individual test results may be forwarded to the Contractor as they become available.

Test data for each aggregate type shall be managed independently. When more than one source is used for supplying material, test data from each source and product shall be managed independently.

The laboratory designated by the Owner shall carry out testing for purposes of ensuring that aggregates used in the Work are according to the physical property and grading requirements of this specification. The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise indicated in this specification. Individual test results shall be forwarded to the Contractor, as they become available.

### **1004.08.02               Laboratory Requirements**

The Contract Administrator shall designate all QA laboratories.

An acceptable laboratory conducting tests for physical properties shall be one that holds a current Type D certificate from CCIL for the applicable test methods and also participates in the annual MTO Proficiency Sample Testing Program for the specific tests, when applicable.

An acceptable laboratory conducting tests for gradation according to LS-602, materials finer than 75 µm by washing of the aggregates according to LS-601, and percent crushed particles according to LS-607 shall be one that holds a current Type C certificate from CCIL.

Testing shall be conducted by qualified laboratory staff that holds a current certificate from CCIL in aggregate testing.

Equivalent alternate laboratory and technician certifications or laboratory proficiency testing programs may be used to demonstrate similar requirements, provided that they are acceptable to the Contract Administrator.

### **1004.08.03               Sampling**

Sampling shall be according to LS-625.

Duplicate samples shall be taken and sealed by the Contractor in the presence of the Contract Administrator at the time and location determined by the Contract Administrator. When material contains blended or reclaimed aggregates or both, QA sampling shall be performed on the final blended product.

The mass of each sample shall meet the requirements of Table 13. When more than 30 kg is required, the total sample shall be recombined by the QA laboratory prior to testing.

In the event that the Contractor is unavailable to take the sample, no further materials shall be placed in the Work until the QA sample has been taken.

The Contractor shall provide new or clean sample bags or containers that are constructed to prevent the loss of any part of the material or contamination or damage to the contents during shipment. Metal or cardboard containers are unacceptable. QA samples shall be identified both on the inside and outside of the sample container.

#### **1004.08.04                      Testing and Retention of Samples**

When the Contract Administrator elects to carry out QA testing, one of the duplicate samples shall be randomly selected for testing by the QA laboratory and the remaining sealed sample shall be retained by the QA laboratory for possible referee testing.

#### **1004.08.05                      Winter Sand**

Following delivery, winter sand shall be subject to a visual inspection of the stockpile to determine the presence of oversize material. Oversize particles may be confirmed with a 9.5 mm sieve.

#### **1004.08.06                      Acceptance**

QA test results shall be used for acceptance purposes, except when referee testing or a visual examination of winter sand has been carried out.

When QA test results show that the material meets the requirements of this specification, the aggregates shall be accepted.

When QA test results show that the material does not meet the requirements of this specification, the Contract Administrator shall notify the Contractor that material represented by the test results shall not be accepted. This notification shall take place in writing within 3 Business Days of receipt of the non-conforming data. The Contractor has the option of either removing the material from the work or invoking referee testing. The Contractor may request a reduced price in lieu of removal for aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

#### **1004.08.07                      Referee Testing**

When QA test results do not meet the requirements of this specification, the Contractor has the option of invoking referee testing of the test result that fails to meet the requirements. The Contractor shall notify the Contract Administrator of the selected option in writing within 2 Business Days following written notification of unacceptable material.

The Contract Administrator shall select a referee testing laboratory acceptable to the Contractor within 3 Business Days following the Contractor's notification to invoke referee testing.

Referee test samples shall be delivered to the referee testing laboratory from the QA laboratory by the Contract Administrator. The sealed sample shall be opened in the presence of the Contractor and the Contract Administrator. If referee materials are not available, the Contractor shall be responsible for obtaining and submitting new samples to the referee laboratory from a location to be decided by the Contract Administrator. The Contract Administrator shall be present to witness the sampling.

Referee testing shall be carried out in the presence of the Contract Administrator. When applicable, the referee testing laboratory shall also test a control aggregate sample for each test method required. The Contractor may observe the testing at no cost to the Owner.

The Contractor and the Owner may send a maximum of two representatives each to observe the referee testing. The Contract Administrator shall notify the Owner and the Contractor a minimum of 3 Business Days in advance of the date of referee testing. Provided that such notice was given, referee testing shall be carried out regardless of the absence of one or more observers.

Observers shall follow the referee laboratory protocols for access to the premises and testing equipment and shall not unnecessarily impede the progress of testing. Observers shall be permitted to validate sample identification and view sample condition. Subject to safety requirements, test method and equipment limitation, the shall also be permitted to observe test procedures, take notes, view equipment readings, and review completed work sheets while in attendance.

Comments on the non-conformity of the test methods shall be made and corrected at the time of testing.

Referee test results shall be binding on both the Owner and the Contractor.

When a referee test result shows that the aggregates do not meet the requirements of this specification, the aggregates represented by the test result, including aggregates in existing stockpiles or in the Work, shall not be accepted. The Contractor shall remove the aggregates from the Work at no cost to the Owner. The Contractor may request a reduced price in lieu of removal of the aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

When a referee test result shows that the aggregates meet the requirements of this specification, the aggregates represented by the sample shall be accepted.

The Owner shall be responsible for the cost of referee testing, provided that the referee test results show that the aggregates meet the applicable specifications. Otherwise, the Contractor shall be responsible for the cost.

**TABLE 1**  
**Physical Property Requirements for Clear Stone**

Laboratory Test	MTO Test Number	Nominal Maximum Size			
		53 mm	19 mm		16 mm, 13.2 mm, and 9.5 mm
			Type I	Type II	
Wash Pass 75 µm Sieve, Guideline B, % maximum	LS-601	2.0	2.0	2.0	2.0
Percent Crushed Particles, % minimum	LS-607	-	50	60	60
Micro-Deval Abrasion, Coarse Aggregate, % maximum loss	LS-618	25	25	25	25

**TABLE 2**  
**Gradation Requirements for Clear Stone**

Sieve Size	Gradation (LS-602), Percent Passing					
	Nominal Maximum Size					
	53 mm	19 mm		16 mm	13.2 mm	9.5 mm
Type I		Type II				
63 mm	100	-	-	-	-	-
53 mm	90 - 100	-	-	-	-	-
26.5 mm	-	100	100	-	-	-
19.0 mm	0 - 15	90 - 100	90 - 100	100	-	-
16.0 mm	-	-	65 - 90	96 - 100	100	-
13.2 mm	-	-	-	67 - 86	96 - 100	100
9.5 mm	-	0 - 55	20 - 55	29 - 52	50 - 73	95 - 100
6.7 mm	-	-	-	-	-	20 - 45
4.75 mm	-	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10
75 µm	0 - 2.0	0 - 2.0	0 - 2.0	0 - 2.0	0 - 2.0	0 - 2.0

**TABLE 3  
Physical Property Requirements for Granular Sheeting**

Laboratory Test	MTO Test Number	Granular Sheeting
Petrographic Requirement, Fine Aggregate Part A	LS-616	(Note 1)
Micro-Deval Abrasion, Coarse Aggregate, % maximum loss (Note 2)	LS-618	30
Micro-Deval Abrasion, Fine Aggregate, % maximum loss	LS-619	35
Plasticity Index, maximum	LS-703/704	0
<p>Notes:</p> <p>1. For materials north of the French/Mattawa Rivers only: For materials with &gt; 4.0% passing the 75 µm sieve, passing the 150 µm sieve and retained on the 75 µm sieve shall not exceed 10% of the material on that sieve. Prior data demonstrating compliance with this requirement shall be acceptable provided such testing has been done within the past 5 years and the Contractor can show to the satisfaction of the Owner that field performance has continued to be acceptable.</p> <p>2. The requirement for the coarse aggregate Micro-Deval abrasion loss test shall be waived if the material has more than 80% passing the 4.75 mm sieve.</p>		

**TABLE 4  
Gradation Requirements for Granular Sheeting**

Sieve Size	Gradation (LS-602), Percent Passing
150 mm	100
26.5 mm	50 - 100
13.2 mm	35 - 100
9.5 mm	-
4.75 mm	20 - 80
1.18 mm	10 - 50
300 µm	5 - 25
150 µm	0 - 15
75 µm	0 - 8.0

**TABLE 5**  
**Physical Property Requirements for Mortar Sand**

<b>Laboratory Test</b>	<b>Test Number</b>	<b>Requirement</b>
Organic Impurities, Organic Plate Number	LS-610	3 (Note 1)
Mortar Strength Test	ASTM C87/C87M	(Note 2)
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. When the fine aggregate is subjected to this test, it shall not produce a colour darker than the standard solution or Organic Plate Number 3. A fine aggregate failing this test may be approved if it meets the requirements of the mortar strength test according to ASTM C87/C87M.</li> <li>2. Mortar specimens comprised of fine aggregate for use as mortar sand and hydraulic cement shall develop a compressive strength at the age of 7 Days of not less than 90% of the strength developed by a mortar prepared in the same manner with the same cement and with graded Ottawa sand having a fineness modulus of <math>2.40 \pm 0.10</math>.</li> </ol>		

**TABLE 6**  
**Gradation Requirements for Mortar Sand**

<b>Sieve Size</b>	<b>Gradation (LS-602), Percent Passing</b>
4.75 mm	100.0
2.36 mm	95 - 100
1.18 mm	60 - 100
600 µm	35 - 80
300 µm	15 - 50
150 µm	2 - 15
75 µm	0 - 5.0

**TABLE 7**  
**Physical Property Requirements for Gabion Stone, Rip-Rap and Rock Protection**

<b>Laboratory Test</b>	<b>Test Number</b>	<b>Rip-Rap</b>	<b>Gabion Stone</b>	<b>Rock Protection</b>
Specific Gravity, minimum	ASTM D6473 (Note 1)	2.50	2.50	2.5
Absorption, % maximum		2.0	2.0	2.0
Flat and Elongated Particles, % maximum	LS-608 (Note 2)	15	15	15
Micro-Deval Abrasion, Coarse Aggregate, Grading A % maximum loss	LS-618 (Note 3)	25	25	25

Notes:

1. These requirements shall be based on the average test results for at least five pieces of rock when the source is macroscopically uniform or at least 8 pieces of rock when the source is macroscopically non-uniform. In addition, no individual piece of tested rock shall have a specific gravity less than 2.30 or absorption greater than 3.5%.
2. These requirements shall be based on measurements taken of at least 20 randomly-chosen pieces of rock either in stockpile at the source or after being delivered to the site.
3. Testing using LS-618 may be carried out on another aggregate product that is being simultaneously produced from the same crushing stage as rip-rap, gabion stone, or rock protection, as long as the other aggregate product being produced is sufficient for sampling and testing, according to the requirements of the procedure. As an example, if the Contractor can show that rip-rap and Granular A which meets the requirements of OPSS 1010 are being simultaneously produced from a primary crusher, a sample of the Granular A may be used for acceptance testing, in-lieu of testing a sample of rip-rap.

**TABLE 8**  
**Gradation Requirements for Gabion Stone, Rip-Rap, and Rock Protection**

Mass kg	Approximate Dimension mm (Note 1)	Gradation, percent less than mass specified (Note 2)				
		Gabion Stone		Rip-Rap		Rock Protection
		G-3	G-10	R-10	R-50	
330	500	-	-	-	-	100
75	305	-	-	-	100	Well-graded
50	265	-	-	-	70 - 90	
25	210	-	-	-	40 - 55	
15	180	-	100	100	-	
10	155	-	90 - 100	70 - 90	-	
5	125	100	-	40 - 55	-	
3	105	90 - 100	-	-	-	0-10
2.5	100	-	0 - 5	-	0 - 15	-
0.5	60	0 - 5	-	0 - 15	-	-

Notes:

1. Masses are based on approximate size of an equivalent cube with a specific gravity of 2.65 and are provided for estimating purposes only.
2. The gradation shall be determined by individually weighing a minimum of 20 randomly-chosen stone particles from a sample taken from the stockpile representing a lot when comparing the total mass of the stone particles within each fraction with the total mass of all of the stone particles measured in the sample. For pieces of rock with masses that are larger than 25 kg, the approximate dimension of the piece determined using an average of three rectilinear measurements of the piece shall be allowed in lieu of weighing.



**TABLE 9**  
**Physical Property Requirements for Truck Arrester Bed Aggregate**

<b>Laboratory Test</b>	<b>MTO Test Number</b>	<b>Requirement</b>
Wash Pass 75 µm Sieve, Guideline B, % maximum	LS-601	1.0
Absorption, % maximum	LS-604	2.0
Unconfined Freeze-Thaw, % maximum loss	LS-614	6
Micro-Deval Abrasion, Coarse Aggregate, % maximum loss	LS-618	21

**TABLE 10**  
**Gradation Requirements for Truck Arrester Bed Aggregate**

<b>Sieve Size mm</b>	<b>Gradation (LS-602), Percent Passing</b>
37.5	100
26.5	90 - 100
19.0	0 - 10

**TABLE 11**  
**Physical Property Requirements for Winter Sand**

<b>MTO Laboratory Test</b>	<b>MTO Test Number</b>	<b>Requirement</b>
Micro-Deval Abrasion, Fine Aggregate, % maximum loss	LS-619	25 (Note 1)

Notes:

1. When obtained from sources on St. Joseph Island, Manitoulin Island, or areas of Ontario south and west of a boundary delineated by the Severn River, Provincial Highway 12, and Provincial Highway 7 east of Highway 12.

**TABLE 12**  
**Gradation Requirements for Winter Sand**

<b>Sieve Size</b>	<b>Gradation (LS-602), Percent Passing</b>
9.5 mm	100.0 (Note 1)
6.7 mm	97 - 100
4.75 mm	90 - 100
2.36 mm	50 - 95
1.18 mm	20 - 90
600 µm	0 - 70
300 µm	0 - 35
150 µm	0 - 15
75 µm	0 - 5.0

**Notes:**

1. In addition to LS-602, to be confirmed by visual inspection of the stockpile.
  
- A. The minimum size of the test sample shall be 5 kg. Following oven drying, the sample shall be sieved on the 9.5 mm, 6.7 mm, and 4.75 mm sieves. Material passing the 4.75 mm sieve shall be split to an appropriate size according to LS-602 for subsequent washing and fine sieving. The final grading shall be calculated according to LS-602 as the percentage of material passing each sieve based on the total mass of the oven dried sample.

**TABLE 13**  
**Sample Size Requirements**

<b>Aggregate Type</b>	<b>Nominal Maximum Size mm</b>	<b>Minimum Sample Size kg</b>
Clear Stone	53	80
	19.0	20
	16.0	15
	13.2	15
	9.5	10
Granular Sheeting		25
Mortar Sand		10
Rip-rap / Gabion Stone / Rock Protection (for physical properties only)		25 (consisting of stone particles from 2 to 5 kg each)
Truck Arrestor Bed Aggregate		75
Winter Sand		10

**Appendix 1004-A, November 2021  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Requirements for meeting QA. (1004.03)
- Reclaimed materials. (1004.05.01)
- Warranty provisions. (1004.08.06)
- Warranty provisions in referee testing. (1004.08.07)

The designer should be aware that OPSS 1004 includes the introduction of physical test methods:

The designer may consider the use of reclaimed materials as an alternate aggregate source material. If so, the designer should specify this requirement in the Contract Documents. (1004.05.01)

The designer should be aware that quality assurance (QA) testing for purposes of ensuring material used in the Work meets the requirements of OPSS 1004 is not mandatory, unless specifically included in the Contract Documents. The designer should determine the need for QA testing based on the size and complexity of the work and specify the required frequency of QA sampling and testing (1006.08.01). Appendix 1004-B provides recommended QA sampling and testing frequencies. The designer should determine if the sampling and testing frequencies provided in Appendix 1004-B are to be used for QA purposes. If so, they need to be invoked by reference in the Contract Documents.

The designer should ensure that the need for stability of 53 mm clear stone is considered. When required, the minimum percent crushed requirement should be added. (Table 1)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

No information provided here.

**Appendix 1004-B, November 2021  
FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Quality Assurance Sampling and Testing Frequencies**

OPSS.MUNI 1004, Aggregates - Miscellaneous, is amended as follows:

**1004.08 Quality Assurance**

**1004.08.01 General**

The first paragraph of subsection 1004.08.01 is deleted in its entirety and replaced with the following:

QA sampling and testing shall be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of the Contract Documents. QA sampling and testing shall be carried out at the frequency specified in Table B-1. Individual test results may be forwarded to the Contractor as they become available.

Table B-1 is added.

**TABLE B-1  
Sampling and Testing Frequencies for Physical Property and Gradation Requirements**

<b>Aggregate Type</b>	<b>Tender Quantity</b>	<b>Minimum Frequency</b>
Clear stone	< 200 tonnes	At the Contract Administrator's discretion.
	≥ 200 tonnes and < 1,000 tonnes	One sample.
	≥ 1,000 tonnes (Note 1)	One sample per 1,000 tonnes.
Gabion Stone, (m <sup>3</sup> of gabion baskets)	< 100 m <sup>3</sup>	At the Contract Administrator's discretion.
	≥ 100 m <sup>3</sup> and < 1,000 m <sup>3</sup>	One sample.
	≥ 1,000 m <sup>3</sup> (Note 1)	One sample per 1,000 m <sup>3</sup> .
Granular Sheeting	< 200 m <sup>2</sup>	At the Contract Administrator's discretion.
	≥ 200 m <sup>2</sup> and < 5,000 m <sup>2</sup>	One sample.
Rip-Rap	≥ 5,000 m <sup>2</sup> (Note 1)	One sample per 5,000 m <sup>2</sup> .
Rock Protection	< 200 m <sup>3</sup>	At the Contract Administrator's discretion.
	≥ 200 m <sup>3</sup> and < 5,000 m <sup>3</sup>	One sample.
	≥ 5,000 m <sup>3</sup> (Note 1)	One sample per 5,000 m <sup>3</sup> .
Truck Arrestor Bed	< 5,000 tonnes	One sample.
	≥ 5,000 tonnes (Note 1)	One sample per 5,000 tonnes.
Winter Sand	< 500 tonnes	At the Contract Administrator's discretion.
	≥ 500 tonnes and ≤ 5,000 tonnes	One sample.
	> 5,000 tonnes (Note 1)	One sample per 5,000 tonnes.

Notes:

1. When the tender quantity of material is:

- a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.
- b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.



**MATERIAL SPECIFICATION FOR  
AGGREGATES - BASE, SUBBASE,  
SELECT SUBGRADE, AND BACKFILL MATERIAL**

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This specification covers the material requirements for aggregates for use in base, subbase, select subgrade, granular surface, shouldering, and backfill material.

### **1010.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

### **1010.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

### **1010.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

#### **Ontario Provincial Standard Specification, Material**

OPSS 1001 Aggregates - General

#### **Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:

LS-601	Material Finer than 75 µm Sieve in Mineral Aggregates by Washing
LS-602	Sieve Analysis of Aggregates
LS-607	Percent Crushed Particles in Processed Coarse Aggregate
LS-614	Freezing and Thawing of Coarse Aggregate
LS-616	Petrographic Analysis of Fine Aggregate
LS-617	Percent Particles with Two or More Crushed Faces and Uncrushed Particles in Processed Coarse Aggregate
LS-618	Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-619	Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-621	Determination of Amount of Asphalt-Coated Particles in Coarse Aggregate



LS-625	Guidelines for Sampling of Aggregate Materials
LS-630	Amount of Contamination of Coarse Aggregates
LS-702	Particle Size Analysis of Soils
LS-703/704	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
LS-709	Permeability of Granular Soils

### 1010.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Air-Cooled Blast-Furnace Slag** means the material resulting from solidification of molten blast-furnace slag under atmospheric conditions. Subsequent cooling may be accelerated by application of water to the solidified surface.

**CCIL** means the Canadian Council of Independent Laboratories.

**Ceramic** means porcelain, china, and whiteware (e.g., sinks, toilets, and bidets made from clay and silica fired at a high temperature, excluding clay brick and tile) that is free of organic materials, metal, and plastic.

**Deleterious Material** means materials from the recycling stream other than glass, ceramic, reclaimed asphalt pavement, and reclaimed concrete material that includes but is not limited to the following: wood, clay brick, clay tile, plastic, gypsum, gypsum plaster, and wallboard.

**Duplicate Samples** means two samples taken at the same time and location-one to be used for quality assurance testing and the other for referee testing.

**Fines** means material passing the 75 µm sieve when tested according to LS-601 or LS-602.

**Free of Clay** means the amount of material with a particle diameter less than 2 µm shall not be greater than 1% of the total sample when tested according to LS-702.

**Glass** means processed glass obtained from the recycling stream that is free of organic materials, metal, and plastic.

**Granular A** means a set of requirements for dense graded aggregates intended for use as granular base within the pavement structure, granular shouldering, and backfill.

**Granular B** means a set of requirements for well-graded aggregates intended for use as granular subbase within the pavement structure and granular backfill. Granular B may be Type I, Type II, or Type III.

**Granular M** means a set of requirements for dense graded aggregates intended for use on unpaved road surfaces and for the maintenance of unpaved shoulders.

**Granular O** means a set of requirements for open graded aggregates intended only for use as a free draining granular base within the pavement structure.

**Granular S** means a set of requirements for dense graded aggregates intended only for use as surface dressing of low volume unpaved roads with an AADT less than 200.

**Nickel Slag** means the non-metallic product resulting from the production of nickel.

**Physical Property** means an inherent attribute or feature of an aggregate or soil material. Tests are carried out to determine a materials resistance to weathering or degradation or both.

**Quality Assurance (QA)** means a system or series of activities carried out by the Owner to ensure that Materials received from the Contractor meet the requirements specified in the Contract Documents.

**Reclaimed Asphalt Pavement (RAP)** means processed hot mix asphalt material that is recovered by partial or full depth removal.

**Reclaimed Concrete Material (RCM)** means removed or processed old hydraulic cement concrete.

**Referee Testing** means testing of a material property or attribute for the purpose of resolving acceptance.

**Select Subgrade Material (SSM)** means a set of requirements for well-graded non-plastic aggregates used to replace poor subgrade materials and as swamp backfill.

**Steel Slag** means the non-metallic product resulting from the production of steel in a basic oxygen furnace or electric arc furnace.

## **1010.05 MATERIALS**

### **1010.05.01 General**

Aggregates shall be according to OPSS 1001, unless otherwise specified in this specification.

Aggregates shall meet the physical property requirements shown in Table 1 and the gradation requirements shown in Table 2.

When aggregates are tested according to LS-630, the total amount of wood shall not exceed 0.1% by mass, and the total amount of deleterious material and other contaminants shall not exceed a combined total of 1.0% by mass.

Glass and ceramic material shall be processed to remove all deleterious organic materials. 100% of the processed glass and ceramic material shall pass the 13.2 mm sieve.

When RCM is permitted, RCM shall not contain loose reinforcing materials.

When air-cooled blast furnace slag, nickel slag, and RAP containing steel slag aggregates are used, site-specific notification shall be given by the Contractor to the Ontario Ministry of the Environment (MOE).

When reclaimed materials are permitted, they shall be homogeneously blended.

Steel slag shall not be used.

When a change in the character of the aggregate occurs or when the performance of the aggregate is found to be unsatisfactory, use of those aggregates shall be discontinued until the Contractor can prove to the satisfaction of the Contract Administrator that the source remains acceptable or can be made acceptable.

### **1010.05.02 Granular A, Granular M, and Granular S**

Granular A, Granular M, and Granular S shall be produced by crushing one or more of the following:

- a) Quarried bedrock.
- b) Boulders, cobbles, gravel, sand, and fines from naturally formed deposits.

- c) RAP up to 30% by mass.
- d) RCM up to 100% by mass.
- e) Air-cooled blast-furnace slag or nickel slag.
- f) Glass or ceramic materials up to a combined total of 15% by mass.

Granular A and Granular M containing RAP with steel slag aggregates shall be acceptable for unpaved gravel shoulders only.

### **1010.05.03                    Granular B**

Granular B may be Type I, Type II, or Type III.

#### **1010.05.03.01                Granular B Type I and Type III**

Granular B Type I and Type III may be produced from naturally formed deposits of sand, gravel, and cobbles or by crushing one or more of the following:

- a) Quarried bedrock.
- b) Air-cooled blast-furnace slag or nickel slag.
- c) RCM up to 100% by mass.
- d) RAP up to 30% by mass.
- e) Glass or ceramic materials up to 15% by mass combined.

RAP containing steel slag aggregates shall not be allowed.

#### **1010.05.03.02                Granular B Type II**

Granular B Type II shall only be produced by crushing:

- a) Quarried bedrock.
- b) Air-cooled blast furnace slag or nickel slag.

Steel slag and reclaimed materials shall not be used in the production of Granular B Type II.

#### **1010.05.04                    Granular O**

Granular O shall only be produced by crushing:

- a) Quarried bedrock.
- b) Cobbles or boulders retained on the 50 mm sieve.

Steel slag and reclaimed materials shall not be used in the production of Granular O.

**1010.05.05                    Select Subgrade Material**

Select subgrade material shall only be produced from natural deposits of non-plastic silt, sand, and gravel material. Reclaimed materials of any type shall not be used.

**1010.07                        PRODUCTION**

**1010.07.01                    Aggregate Processing, Handling, and Stockpiling**

Aggregates that have become mixed with foreign matter of any description or aggregates that have become mixed with each other shall not be used and shall be immediately removed from the stockpile.

**1010.08                        QUALITY ASSURANCE**

**1010.08.01                    General**

QA testing may be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of this specification. Individual test results shall be forwarded to the Contractor, as they become available.

Test data for each aggregate type shall be managed independently. When more than one source is used for supplying materials, test data from each source and product shall be managed independently.

The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise specified in the Contract Documents.

**1010.08.02                    Laboratory Requirements**

The Contract Administrator shall designate the QA laboratories.

An acceptable laboratory conducting tests for physical properties shall be one that holds a current Type D certificate from CCIL for the applicable test methods and also participates in the annual MTO Proficiency Sample Testing Program for the specific tests, except LS-616 and LS-709.

An acceptable laboratory conducting tests for gradation according to LS-602 and percent crushed particles according to LS-607 shall be one that holds a current Type C certificate from CCIL.

Testing shall be conducted by qualified laboratory staff that holds a current certificate from CCIL in aggregate testing.

Equivalent alternate laboratory and technician certifications or laboratory proficiency testing programs may be used to demonstrate similar requirements, provided that they are acceptable to the Contract Administrator.

**1010.08.03                    Sampling**

Sampling shall be according to LS-625.

Duplicate samples shall be taken and sealed by the Contractor in the presence of the Contract Administrator at the time and location determined by the Contract Administrator. When materials contain blended or reclaimed aggregates or both, QA sampling shall be performed on the final blended product.

The mass of each sample shall meet the requirements shown in Table 3. When more than 30 kg is required, the total samples shall be recombined by the QA laboratory prior to testing.

In the event that the Contractor is unavailable to take the sample, no further materials shall be placed in the work until the duplicate samples been taken.

The Contractor shall provide new or clean sample bags or containers that are constructed to prevent the loss of any part of the material or contamination or damage to the contents during shipment. Metal or cardboard containers are unacceptable.

QA samples shall be identified on both the inside and the outside of the sample container.

#### **1010.08.04 Testing and Retention of Samples**

When the Contract Administrator elects to carry out QA testing, one of the duplicate samples shall be randomly selected for testing by the QA laboratory and the remaining sealed sample shall be retained by the QA laboratory for possible referee testing.

#### **1010.08.05 Acceptance**

QA test results shall be used for acceptance purposes, except when referee testing has been carried out.

When QA test results show that the aggregates meet the requirements of this specification, the aggregates shall be accepted.

When QA test results show that the aggregates do not meet the requirements of this specification, the Contract Administrator shall notify the Contractor that aggregates represented by the test results shall not be accepted. This notification shall take place in writing within 3 Business Days of receipt of the non-conforming data. The Contractor has the option of either removing the aggregates from the work or invoking referee testing. The Contractor may request a reduced price in lieu of removal of aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

At the discretion of the Contract Administrator, irrespective of non-compliance with the requirements of this specification, aggregates may be accepted on the basis of satisfactory field performance.

#### **1010.08.06 Referee Testing**

When QA test results do not meet the requirements of this specification, the Contractor has the option of invoking referee testing of the test result that fails to meet the requirements. The Contractor shall notify the Contract Administrator of the selected option in writing within 2 Business Days following written notification of unacceptable material.

The Contract Administrator shall select a referee laboratory acceptable to the Contractor within 3 Business Days following the Contractor's notification to invoke referee testing. Referee test samples shall be delivered to the referee testing laboratory from the QA laboratory by the Contract Administrator. The sealed sample shall be opened in the presence of the Contractor and the Contract Administrator. If referee materials are not available, the Contractor shall be responsible for obtaining and submitting new samples to the referee laboratory from a location to be decided by the Contract Administrator. The Contract Administrator shall be present to witness the sampling.

Referee testing shall be carried out in the presence of the Contract Administrator. When applicable, the referee laboratory shall also test a control aggregate sample for each test method required. The Contractor may observe the testing at no cost to the Owner.

The Contractor and Owner may send a maximum of two representatives each to observe the referee testing. The Contract Administrator shall notify the Owner and Contractor a minimum of 3 Business Days in advance of the date of referee testing. Provided that such notice was given, referee testing shall be carried out regardless of the absence of one or more observers.

Observers shall follow the referee laboratory protocols for access to the premises and testing equipment and shall not unnecessarily impede the progress of the testing. Observers shall be permitted to validate sample identification and view sample condition. Subject to safety requirements, test method and equipment limitations, they shall also be permitted to observe test procedures, take notes, view equipment readings and review completed work sheets while in attendance.

Comments on the non-conformity of the test methods shall be made and corrected at the time of testing.

Referee test results shall be binding on both the Owner and the Contractor.

When a referee test result shows that the aggregates do not meet the requirements of this specification, the aggregates represented by the test result, including aggregates in existing stockpiles or in the Work, shall not be accepted. The Contractor shall remove the aggregates from the Work at no cost to the Owner. The Contractor may request a reduced price in lieu of the removal of aggregates that fail to meet the requirements of this specification. Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

When a referee test result shows that the aggregates meet the requirements of this specification, the aggregates represented by the sample shall be accepted.

The Owner shall be responsible for the cost of referee testing provided that the referee test results show that the aggregates meet the applicable specifications. Otherwise, the Contractor shall be responsible for the cost.

**TABLE 1**  
**Physical Property Requirements**

<b>MTO Laboratory Test and Number</b>	<b>Granular O</b>	<b>Granular A</b>	<b>Granular S</b>	<b>Granular B Type I and Type III</b>	<b>Granular B Type II</b>	<b>Granular M</b>	<b>Select Subgrade Material</b>
Percent crushed particles, % minimum, LS-607	100	60	50	--	--	60	--
Unconfined Freeze-Thaw, % maximum loss, LS-614	15	--	--	--	--	--	--
2 or more crushed faces, % minimum, LS-617	85 (Note 1)	--	--	--	--	--	--
Micro-Deval Abrasion Coarse Aggregate, % maximum loss, LS-618	21	25	25	30 (Note 2)	30	25	30 (Note 2)
Micro-Deval Abrasion, Fine Aggregate, % maximum loss, LS-619	25	30	30	35	35	30	N/A
Asphalt Coated Particles, % maximum, LS-621	0	30	30	30	0	30	0
Amount of Contamination, LS-630	(Note 3)						
Plasticity Index, maximum LS-703/704	0						
Determination of Permeability, k, LS-709	(Note 4)						

**Notes:**

1. When Granular O is produced from boulders, cobbles, or gravel retained on the 50 mm sieve.
2. The coarse aggregate Micro-Deval abrasion loss test requirements shall be waived if the material has more than 80% passing the 4.75 mm sieve.
3. Granular A, B Type I, B Type III, or M may contain crushed glass or ceramic materials up to a combined total of 15% by mass. Granular A, B Type I, B Type III, M, O, and S shall not contain more than 1% by mass of wood, clay brick and/or gypsum and/or gypsum wall board or plaster. Granular B Type II and SSM shall not contain more than 0.1% by mass of wood.
4. For materials north of the French and Mattawa Rivers only, the coefficient of permeability, k, shall be greater than  $1.0 \times 10^{-4}$  cm/s or alternatively, where past field experience has demonstrated satisfactory performance. Prior data demonstrating compliance with this requirement for k shall be acceptable, provided such testing has been done within the 5 years of the material being used and field performance has continually been shown to be satisfactory.

**TABLE 2**  
**Gradation Requirements - Percent Passing**

MTO Test	Sieve	Granular							Select Subgrade Material
		A	B (Note 1)			M	O	S	
			Type I (Note 2)	Type II	Type III (Note 2)				
Sieve Analysis, % Passing, LS-602	150 mm	N/A	100	N/A	100	N/A	N/A	N/A	100
	106 mm	N/A	N/A	100	N/A	N/A	N/A	N/A	N/A
	37.5 mm	N/A	N/A	N/A	N/A	N/A	100	N/A	N/A
	26.5 mm	100	50-100	50-100	50-100	N/A	95-100	100	50-100
	19.0 mm	85-100 (87-100, Note 3)	N/A	N/A	N/A	100	80-95	90-100	N/A
	13.2 mm	65-90 (75-95, Note 3)	N/A	N/A	N/A	75-95	60-80	75-100	N/A
	9.5 mm	50-73 (60-83, Note 3)	N/A	N/A	32-100	55-80	50-70	60-85	N/A
	4.75 mm	35-55 (40-60, Note 3)	20-100	20-55	20-90	35-55	20-45	40-60	20-100
	1.18 mm	15-40	10-100	10-40	10-60	15-40	0-15	20-40	10-100
	300 µm	5-22	2-65	5-22	2-35	5-22	N/A	11-25	5-95
	150 µm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.0-65.0
	75 µm	2.0-8.0 (2.0-10.0, Note 4)	0-8.0 (0-10.0, Note 4)	0-10.0	0-8.0 (0-10.0, Note 4)	2.0-8.0 (2.0-10.0, Note 4)	0-5.0	9.0-15.0 (9.0-17.0, Note 4)	0-25.0

**Notes:**

1. When Granular B is used for granular backfill for pipe subdrains, 100% of the material shall pass the 37.5 mm sieve.
2. When RAP is blended with Granular B Type I or Type III, 100% of the RAP shall pass the 75 mm sieve. Conditions in Note 1 supersede this requirement.
3. When the aggregate is obtained from an air-cooled blast furnace slag source.
4. When the aggregate is obtained from a quarry or an air-cooled blast furnace slag or nickel slag source.



**TABLE 3**  
**Sample Size**

<b>Material</b>	<b>Minimum Mass of Individual Field Samples kg</b>
Granular A, S, M, and O	25
Granular B and SSM	50
Granular B and SSM (100% passing 26.5 mm sieve)	25
Note: A. Each sample container shall hold no more than 30 kg of aggregate. When more than 30 kg is required, additional sample containers shall be used.	

**Appendix 1010-A, November 2013  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Type of Granular B to be used. (1010.05.03)

The designer should determine if the following is required and, if so, specify it in the Contract Documents:

- If the quality assurance sampling and testing frequencies provided in Appendix 1010-B are to be used, Appendix 1010-B needs to be invoked by reference in the Contract Documents.
- If the payment reduction in lieu of aggregate removal provided in Appendix 1010-C is to be used, Appendix 1010-C needs to be invoked by reference in the Contract Documents.
- If the test data forms in Appendices 1010-D and 1010-E are to be used for submission purposes, Appendices 1010-D and 1010-E need to be invoked by reference in the Contract Documents.

The use of steel slag aggregate is prohibited.

The designer should be aware that aggregates that are wholly or partially comprised of industrial by-products and/or recycled materials such as, but not limited to, air-cooled iron blast furnace slag, nickel slag, and RAP containing steel slag aggregates, may have specific placement and approval requirements or constraints to mitigate adverse affects on the environment based on local conditions and/or municipal and MOE policy. Prior to tendering, when such Owner supplied or specified materials are to be used, the designer should provide site notification to MOE and ensure any applicable environmental placement and approval requirements and constraints are included in the Contract Documents.

RAP content is determined by LS-621, percent Asphalt Coated Particles. However, this test is limited to identifying RAP content in the coarse aggregate portion only. When RAP in fine aggregate is a concern a Petrographic Examination of the material passing the 4.75 mm sieve is recommended. (1010.05.02)

The designer should be aware that quality assurance (QA) testing for the purpose of ensuring material used in the work meet the requirements of OPSS 1010 is not mandatory unless specifically included in the Contract Documents. The designer should determine the need for QA testing based on the size and complexity of the work and specify the required frequencies of QA sampling and testing. Appendix 1010-B provides recommended QA sampling and testing frequencies.

The designer may specify a higher percent crushed requirement to improve performance in higher traffic areas.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Appendix 1010-A**

**Related Ontario Provincial Standard Drawings**

No information provided here.

**Appendix 1010-B, November 2013**

**FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Quality Assurance Sampling and Testing Frequency**

OPSS.MUNI 1010, Aggregates-Base, Subbase, Select Subgrade, and Backfill Material, is amended as follows:

**1010.08 QUALITY ASSURANCE**

**1010.08.01 General**

The first paragraph of subsection 1010.08.01 is deleted in its entirety and replaced with the following:

QA sampling and testing shall be carried out by the Owner for the purposes of ensuring that the aggregates used in the work are according to the requirements of the Contract Documents. QA sampling and testing shall be carried out at the frequency specified in Table B-1. Individual test results may be forwarded to the Contractor as they become available.

Table B-1 is added.

**TABLE B-1  
Sampling and Testing Frequency for Physical Property Requirements**

<b>Quantity from Each Source or Process</b>	<b>Granular A; Granular B - Type I, II, and III; Granular M; Granular O; and Select Subgrade Material</b>
≤ 5,000	One sample.
> 5,000 (Note 1)	One sample per 5,000 tonnes.
<p><b>Note:</b></p> <p>1. When the quantity of material is:</p> <ul style="list-style-type: none"> <li>a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.</li> <li>b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.</li> </ul>	

**Appendix 1010-B**

Table B-2 is added.

**TABLE B-2  
Sampling and Testing Frequency for Gradation Requirements**

<b>Quantity from Each Source or Process t</b>	<b>Granular A, O, and M</b>	<b>Granular B - Type I, II, and III, and Select Subgrade Material</b>
< 250	At the Contract Administrator's discretion.	
≥ 250 and ≤ 1,000	One sample.	
> 1,000 (Note 1)	One sample per 1,000 tonnes.	
<p>Note:</p> <ol style="list-style-type: none"> <li>1. When the quantity of granular material is:               <ol style="list-style-type: none"> <li>a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.</li> <li>b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.</li> </ol> </li> </ol>		

**Appendix 1010-C, November 2013**

**FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**Supplementary Requirements for Reduced Price Payment In Lieu of Aggregate Removal**

When a tested sample of aggregates shows that the aggregates do not meet the requirements of this specification, the aggregates represented by the test result, including material in existing stockpiles or in the Work, shall not be accepted. The Contractor may request a reduced price in lieu of removal provided the applicable test results:

- a) Do not exceed the requirement for LS-614 by more than 25% of the specified value.
- b) Do not exceed the requirement for LS-618 by more than 10% of the specified value.
- c) Do not identify a plasticity index within the material when determined according to LS-703/704 and the requirement for LS-602 on the 75 µm is met.
- d) Meet all other requirements of this specification.

Irrespective of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

**Appendix 1010-D, November 2013**

**FOR USE IN MUNICIPAL CONTRACTS, WHEN REFERENCED IN THE CONTRACT DOCUMENTS**

**Note:** This is a non-mandatory Additional Information Appendix intended to provide supplementary requirements for the OPS specification in a municipal contract, when the appendix is invoked by the Owner. It is written in mandatory language to permit invoking it by reference in the Contract Documents. If the appendix has not been invoked by reference in the Contract Documents, it does not apply.

**OPSS 1010 - Aggregate Test Data - Granulars  
Physical Properties**

Contract No.:		Contractor:		Contract Location:	
Name of Testing Laboratory:			Telephone No.:		Fax No.:
Sampled by (Print Name):			Date Sampled (YY/MM/DD):		Date Tested (YY/MM/DD):
Granular Type:			Quantity (tonnes) :		
Source Name/Location:			Aggregate Inventory Number (AIN) :		

Laboratory Test and Number	Requirements								Test Results		
	A	B Type I	B Type II	B Type III	M	O	S	SSM	Reference Material	Sample	Meets Requirements (Y/N)
Crushed Particles, % minimum, LS-607	60	--	100	--	60	100	50	--			
Unconfined Freeze-Thaw, % maximum loss, LS-614	--	--	--	--	--	15	--	--			
2 or more Crushed Faces, % minimum, LS-617	--	--	--	--	--	85 (Note 1)	--	--			
Micro-Deval Abrasion, Coarse Aggregate % maximum loss, LS-618	25	30 (Note 2)	30	30 (Note 2)	25	21	25	30 (Note 2)			
Micro-Deval Abrasion, Fine Aggregate % maximum loss, LS-619	30	35	35	35	30	25	30	--			
Asphalt Coated Particles, % maximum, LS-621	30	30	0	30	30	0	30	0			
Amount of Contamination, LS-630	(Note 3)										
Plasticity Index, maximum, LS-703/704	0										
Determination of Permeability, <i>k</i> , LS-709	(Note 4)										

Notes:  
 1. When Granular O is produced from boulders, cobbles, or gravel retained on the 50 mm sieve.  
 2. The coarse aggregate Micro-Deval abrasion loss test requirement shall be waived if the material has more than 80% passing the 4.75 mm sieve.  
 3. Granular A, B Type I, B Type III, or M may contain up to 15 percent by mass crushed glass or ceramic materials. Granular A, B Type III, M, O, and S shall not contain more than 1.0 percent by mass of wood, clay brick and/or gypsum and/or gypsum wall board or plaster. Granular B Type II and SSM shall not contain more than 0.1 percent by mass of wood.  
 4. For materials north of the French/Mattawa Rivers only, the coefficient of permeability, *k*, shall be greater than  $1.0 \times 10^{-4}$  cm/s or field experience has demonstrated satisfactory performance. Prior data demonstrating compliance with this requirement for *k*, shall be acceptable provided that such testing has been done within 5 years of the material being used and field performance has continually been shown to be satisfactory.

I hereby certify that testing has been carried out by a properly qualified/certified test technician:

Issued by: \_\_\_\_\_  
 PRINT NAME TESTING LABORATORY REPRESENTATIVE SIGNATURE DATE

Received by: \_\_\_\_\_  
 PRINT NAME CONTRACT ADMINISTRATOR REPRESENTATIVE SIGNATURE DATE

Copies to: Contract Administrator Contractor







**MATERIAL SPECIFICATION FOR  
CHAIN-LINK FENCE COMPONENTS**

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<b>1541.04</b>	<b>DESIGN AND SUBMISSION REQUIREMENTS - Not Used</b>
<b>1541.05</b>	<b>MATERIALS</b>
<b>1541.06</b>	<b>EQUIPMENT - Not Used</b>
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<b>1541.08</b>	<b>QUALITY ASSURANCE - Not Used</b>
<b>1541.09</b>	<b>OWNER PURCHASE OF MATERIAL</b>

**APPENDICES**

<b>1541-A</b>	<b>Commentary</b>
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**1541.01 SCOPE**

This specification covers the requirements for chain-link fence components and hardware.

**1541.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

## **1541.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1541.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Ontario Provincial Standard Specifications, Construction**

OPSS 772 Chain-Link Fence

### **Canadian General Standards Board (CGSB)**

138.1-96 Fabric for Chain Link Fence  
138.2-96 Steel Framework for Chain Link Fence  
138.4-96 Gates for Chain Link Fence

### **ASTM International**

A 27/A 27M-17 Steel Casting, Carbon, for General Application  
A 153/A 153M-16 Zinc Coating (Hot-Dip) on Iron and Steel Hardware  
A 824-01 (2017) Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence  
F 626-14 Fence Fittings

## **1541.03 DEFINITIONS**

For the purpose of this specification, the definitions in OPSS 772 apply.

**1541.05 MATERIALS**

**1541.05.01 Fence Fabric**

The fence fabric shall be 1,200 or 1,800 mm wide according to the Contract Documents, with a uniform 50 mm diamond pattern chain-link mesh closed at one edge by knuckling and at the other edge by twisting.

The steel wire for chain-link fence fabric shall be according to CAN/CGSB 138.1. The fence fabric shall be one of the types listed in Table 1.

The vinyl coating for wire fabric shall be black in colour.

**1541.05.02 Posts and Rails**

All posts, post sleeves, and rails shall be galvanized steel pipe and shall be according to CAN/CGSB 138.2.

When vinyl-coated fence fabric is used, all posts, post sleeves, and rails shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1.

**1541.05.03 Diagonal Wire Braces, Top and Bottom Wires for use with Galvanized Steel Fence Fabric**

Top wire, bottom wire, and diagonal wire braces shall be 4.50 mm diameter marcelled tension wire Type II according to ASTM A 824 with a minimum Class 5 galvanized coating.

**1541.05.04 Diagonal Wire Braces, Top and Bottom Wires for use with Vinyl-Coated Fence Fabric**

Top wire, bottom wire, and diagonal wire braces shall be 4.50 mm diameter marcelled tension wire Type II according to ASTM A 824 with a minimum Class 3 galvanized coating. The wire shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1

**1541.05.05 Gates**

Gates shall be constructed from galvanized steel pipe frames and braces according to CAN/CGSB 138.4. All joints shall be electrically welded and coated with a zinc rich paint after welding.

When vinyl-coated fence fabric is used, gate frames and braces shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1.

**1541.05.06 Fittings**

Tension bars, tension bands, brace bands, top rail sleeves, and rail ends shall be according to ASTM F 626.

Barbed wire arms shall be fabricated from galvanized pressed steel or cast iron according to CAN/CGSB 138.2 or ASTM F 626.

Terminal and line post caps shall be according to ASTM F 626.

When vinyl-coated fence fabric is used, the fittings shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1

**1541.05.07 Hardware**

All required hardware including, but not limited to carriage bolts and nuts, shall be hot dip galvanized according to ASTM A 153.

**1541.05.08 Fasteners**

Wire ties for attaching fence fabric to line posts, bottom wires, top rails, and top wires shall be according to ASTM F 626.

**1541.05.08.01 Fasteners for Galvanized Steel Fence Fabric**

Wire ties for attaching fence fabric to line posts and top rails shall be manually fastened round wire ties, 3.76 mm diameter steel wire, with a minimum 488 g/m<sup>2</sup> galvanized coating or power fastened round wire ties, 3.76 mm diameter steel wire, with a minimum of 488 g/m<sup>2</sup> galvanized coating.

Wire ties for attaching fence fabric to bottom or top wires shall be round wire hog rings, 2.69 mm diameter steel wire, with a minimum 488 g/m<sup>2</sup> galvanized coating.

**1541.05.08.02 Fasteners for Vinyl Coated Fence Fabric**

Wire ties for attaching fence fabric to line posts and top rails shall be manually fastened round wire ties, 3.76 mm diameter zinc or aluminum coated steel core wire, with a vinyl coating or power fastened round wire ties, 3.76 mm diameter zinc or aluminum coated steel core wire, with a vinyl coating.

Wire ties for attaching fence fabric to bottom or top wires shall be round wire hog rings, 2.69 mm diameter zinc or aluminum coated steel core wire, with a vinyl coating.

Fasteners shall be vinyl-coated to match the class and colour of the vinyl-coated fence fabric and shall be according to CAN/CGSB 138.1.

**1541.05.09 Turnbuckles**

Turnbuckles shall be drop forged steel according to ASTM A 27 and shall be galvanized according to ASTM A 153.

The average overall length shall be approximately 300 mm with ends in the closed position. Bolt diameter shall be approximately 10 mm and capable of taking up a minimum of 150 mm slack.

**1541.05.10 Barbed Wires**

Barbed wires shall be according to CAN/CGSB 138.2.

**1541.07 PRODUCTION**

**1541.07.01 Gates**

All gates shall be supplied with galvanized malleable iron or pressed steel hinges, latch, and latch catch and shall be capable of opening approximately 180 degrees. Gate latches shall be suitable for use with padlocks that can be attached and operated from either side of the gate.

Gates shall be supplied completely assembled, including the fabric. The gate fabric and wire ties used on the gate shall match the adjacent fence fabric and be subjected to the same quality requirements.

**1541.09                      OWNER PURCHASE OF MATERIAL**

**1541.09.01                      Measurement and Payment**

Measurement of fence fabric shall be by length in metres.

Measurement of barbed wire shall be by length in metres.

For measurement purposes, a count shall be made of the number of posts and rails delivered and accepted.

Diagonal wire brace and top and bottom wires shall be measured in the units specified in the purchasing order.

For measurement purposes, a count shall be made of the gates delivered and accepted, regardless of the size and type of gate. Double gates shall be counted as one gate.

For measurement purposes, a count shall be made of the fittings and hardware of each type specified in the purchasing order delivered and accepted.

For measurement purposes, a count shall be made of the number of turnbuckles delivered and accepted.

Payment at the price specified in the purchasing order shall be for the supply of fence fabric, posts and rails, diagonal wire braces, top and bottom wires, gates, fittings and accessories, turnbuckles, and barbed wires delivered to the destination on the date and time specified.

The cost of all testing, except that performed in the Owner's laboratory, shall be included in the price.

**TABLE 1  
Fence Fabric**

<b>Type</b>	<b>Nominal Diameter of Zinc-Coated Wire mm</b>	<b>Minimum Weight of Galvanized Coating g/m<sup>2</sup></b>	<b>Nominal Diameter of Vinyl-Coated Wire mm</b>	<b>Minimum Wire Breaking Strength N</b>	<b>Standard</b>
Class B - Zinc-Coated Galvanized Before Weaving (WGW) Steel Fabric	3.5	488	n/a	5000	CAN/CGSB 138.1
Class D - Vinyl-Coated Steel Fabric	3.5	90	4.26	5000	CAN/CGSB 138.1

**Appendix 1541-A, April 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 972.101	Fence, Chain-Link, Component - Barbed Wire
OPSD 972.102	Fence, Chain-Link, Component - Gate
OPSD 972.130	Fence, Chain-Link, Installation - Roadway
OPSD 972.131	Fence, Chain-Link, Installation - Concrete Barrier
OPSD 972.132	Fence, Chain-Link, Details and Table



**MATERIAL SPECIFICATION FOR  
CORRUGATED STEEL PIPE (CSP) PRODUCTS**

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**APPENDICES**

<b>1801-A</b>	<b>Commentary</b>
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**1801.01 SCOPE**

This specification covers the requirements for all corrugated steel pipe products to be used for storm sewers, pipe culverts, and subdrains.

**1801.01.01 Specification Significance and Use**

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be as specified in the Contract Documents.



## **1801.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1801.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **Corrugated Steel Pipe Institute**

- Bulletin 18 Certification Program for Corrugated Steel Pipe Institute Members & Products CSA G401 Protocol
- Bulletin 19 Certification Program for Structural Plate Corrugated Steel Pipe Products and Deep Corrugated Structural Plate Products

### **CSA Standards**

- G401-14 Corrugated Steel Pipe Products

## **1801.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Certification Body** means an independent 3<sup>rd</sup> party agency accredited by the Standards Council of Canada that has the qualifications, skills, and expertise required to confirm that a pipe manufacturer produces pipe products to the quality and requirements of an accepted standard and that has the mandate to certify the pipe products produced.

**Certified** means pipe products that have been marked with a certification body's logo confirming that the production of the pipe product is in accordance with the quality and requirements of CSA G401.

**Corrugated Steel Pipe Products** means any one or any combination of the following products:

- round corrugated steel pipe with an end finish
- corrugated steel pipe arch with an end finish
- round structural plate corrugated steel pipe with an end finish
- structural plate corrugated steel pipe arch with an end finish
- round spiral rib pipe with an end finish
- spiral rib steel pipe arch with an end finish
- perforated corrugated steel pipe
- corrugated steel pipe coupler bands with or without gasket
- corrugated steel pipe end sections
- corrugated steel pipe safety slope end treatments
- corrugated steel pipe saddle branches

**Delivered Quality** means the pipe products' physical condition upon arrival at the construction site in terms of the extent and degree of dents, scratches, cracks, pipe coating integrity, etc., that appear on the pipe products delivered.

**1801.05 MATERIALS**

**1801.05.01 Corrugated Steel Pipe Products**

Corrugated steel pipe products shall be according to CSA G401 and Appendix A of the same standard. CSP coating shall be galvanized, aluminized Type 2, or polymer laminated and structural plate culvert coating shall be galvanized or thermoplastic co-polymer as specified in the Contract Documents.

**1801.07 PRODUCTION**

**1801.07.01 Fabrication**

The pipe diameter, wall thickness, coating, and type of all corrugated steel pipe products shall be as specified in the Contract Documents.

All corrugated steel pipe products used on the Contract shall be supplied from a manufacturer that is certified to produce corrugated steel pipe products in accordance with CSA G401. Refer to the Corrugated Steel Pipe Institute's technical bulletins 18 for CSP and 19 for SPCS plant CSA certification programs.

When the delivered quality of certified corrugated steel pipe products is deemed to be unacceptable by the Contract Administrator, the products shall be rejected.

**1801.08 QUALITY ASSURANCE**

**1801.08.01 Inspection, Testing, and Record Keeping**

Inspection, testing, and record keeping for corrugated steel pipe products shall be according to CSA G401.

**1801.08.02 Markings**

Certified corrugated steel round pipe and pipe arch and certified spiral rib round pipe and pipe arch shall be marked according to CSA G401, along with the logo of the certification body and name of the pipe manufacturer.

Certified structural plate corrugated steel pipe plate shall be marked according to CSA G401, along with the logo of the certification body and name of the pipe manufacturer.

Accepted certification body logos confirming certified corrugated steel pipe products shall be as shown in Figures 1 and 2.

### **1801.08.03                      Certificate of Compliance**

When requested by the Owner, the Contractor shall provide a certificate of compliance for subdrains and the corrugated steel pipe products used for eccentric loader assemblies to indicate that the product was produced and tested according to the appropriate specification requirements.

When requested by the Owner, the Contractor shall provide a copy of the certificate of compliance from the manufacturer for storm sewers and pipe culverts. The manufacturer's certificate of compliance shall be issued by the certification body confirming that the manufacturer produces certified corrugated steel pipe products in accordance with CSA G401.

### **1801.09                              OWNER PURCHASE OF MATERIAL**

Measurement of corrugated steel pipe with corrugated steel coupler bands shall be by length in metres along the centreline of the pipe.

For measurement purposes, a count shall be made of all other corrugated steel pipe products.

Payment at the price specified in the purchasing order shall be for the supply of corrugated steel pipe with coupler bands and other corrugated steel pipe products delivered to the destination on the date and time specified.

The cost of all testing, except that performed in the Owner's laboratory, shall be included in the price.



**FIGURE 1**  
**CSA Standards Certification Logo**



**FIGURE 2**  
**Canadian Welding Bureau Certification Logo**

**Appendix 1801-A, November 2019  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The designer should specify the following in the Contract Documents:

- Coating type. (1801.05.01)
- Pipe diameter, wall thickness, coating, and type. (1801.07.01)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 800.010	Concrete Pipe Culvert and Sewer Extensions Using Corrugated Steel Pipe
OPSD 800.011	Concrete Rigid Frame Box and Open Culvert Extensions Using Corrugated Steel Pipe
OPSD 801.010	Cut End Finish, Circular Pipe and Pipe-Arch Corrugated Steel Pipe
OPSD 801.020	End Section Details, Corrugated Steel Pipe
OPSD 801.030	Bevel Details, Circular and Pipe-Arch Structural Plate, Corrugated Steel Pipe
OPSD 801.040	Culvert and Sewer Safety Slope End Treatment, Notes and Tables
OPSD 801.041	Culvert and Sewer Safety Slope End Treatment, Assembly Details
OPSD 801.042	Culvert and Sewer Safety Slope End Treatment, Connection Details
OPSD 801.043	Culvert and Sewer Safety Slope End Treatment, Installation Details
OPSD 805.010	Height of Fill Table, Round Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe
OPSD 805.020	Height of Fill Table, Corrugated Steel Pipe-Arch and Structural Plate Corrugated Steel Pipe-Arch
OPSD 805.030	Height of Fill Table, Spiral Rib Round Pipe
OPSD 805.040	Height of Fill Table, Spiral Rib Pipe-Arch



## **MATERIAL SPECIFICATION FOR GEOTEXTILES**

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<b>1860.09</b>	<b>OWNER PURCHASE OF MATERIAL</b>
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#### **1860.01 SCOPE**

This specification covers the material requirements for geotextiles.

##### **1860.01.01 Specification Significance and Use**

This specification has been developed for use in municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

##### **1860.01.02 Appendices Significance and Use**

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

## **1860.02 REFERENCES**

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

### **ASTM International**

D 4354-12	Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing
D 4355/D 4355M-14	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
D 4491/D 4491M-17	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D 4533/D 4533M-15	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
D 4873-16	Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
D 4632/D 4632M-15a	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
D 6241-14	Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50 mm Probe

### **Canadian General Standards Board (CGSB)**

148.1 No. 10-94	Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size
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### **Bureau de Normalisation du Québec (BNQ)**

BNQ 7009-910	Geotextiles - Quality of Geotextiles Used in Road Engineering - Certification Protocol
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## 1860.03

### DEFINITIONS

For the purpose of this specification, the following definitions apply:

**Duplicate Samples** means two samples taken at the same time and location, one to be used for quality assurance testing and the other for referee testing.

**Filtration Opening Size (FOS)** means the opening size of a geotextile in microns corresponding to 95% by mass particle diameter passing through the geotextile in the hydrodynamic sieving test CAN/CGSB 148.1, Method No. 10.

**Geosynthetic** means a synthetic material used in geotechnical engineering applications. Geosynthetics may include such items as geotextiles, geomembranes, geocells, geogrids, geonets, and geocomposites.

**Geotextile** means a permeable synthetic textile material that is used in association with foundation, soil, rock, earth, or other geotechnical related material for one or more of the following functions: separation, filtration, drainage, or protection. They may be woven, non-woven, or knitted.

**Lat** means a length equal to the circumference of a full geotextile roll provided by the manufacturer.

**Minimum Average Roll Value (MARV)** means the average value minus two standard deviations of a given property established by the manufacturer during production. The average roll value for a given property must meet or exceed this value.

**Quality Assurance (QA)** means a system or series of activities carried out by the Owner to ensure that materials received from the Contractor meet the specified requirements.

**Quality Control (QC)** means a system or series of activities carried out by the Contractor, Subcontractor, supplier, and manufacturer to ensure that materials supplied to the Owner meet the specified requirements.

**Referee Testing** means testing of a material attribute for the purpose of resolving acceptance issues at the request of the Contractor or the Owner.

## 1860.04

### DESIGN AND SUBMISSION REQUIREMENTS

#### 1860.04.01

#### Submission Requirements

Prior to the use of a geotextile in the Work, a certificate from the manufacturer stating the name of the manufacturer, product name, style number, chemical composition, and other pertinent information required to fully describe the geotextile as evaluated under the manufacturer's QC program, shall be submitted to the Contract Administrator. The certificate shall identify the name of the supplier of the geotextile covered pipe or tubing. A person having legal authority to bind the manufacturer or supplier shall attest to this certificate.

Upon request, documentation describing the manufacturer's QC program shall be made available to the Contract Administrator.

The requirements stated above shall be waived for geotextiles certified according to BNQ 7009-910.

## 1860.05

### MATERIALS

Geotextile fibre or yarn shall be composed of at least 95% by mass of polypropylene, polyethylene, polyester, or other synthetic polymers, excluding polyamides.



Geotextiles shall contain stabilizers or inhibitors, if necessary, to make the filaments resistant to deterioration by excessive ultraviolet (UV) light and heat exposure. Geotextiles shall be resistant to acid and alkali action and shall be unaffected by micro-organisms and insects.

## **1860.07                    PRODUCTION**

### **1860.07.01                Woven Geotextiles**

Woven geotextiles shall be produced by interlacing two or more sets of filaments, yarns, fibres, film, tape, or other elements in such a way that the elements pass each other, essentially at right angles and with one set of elements parallel to the fabric axis. The edge of woven geotextiles shall be finished to prevent the outer yarn from pulling away.

### **1860.07.02                Non-Woven Geotextiles**

Non-woven geotextiles shall consist of a manufactured sheet, web, or batt of directionally or randomly-oriented fibres, filaments, or other elements produced by bonding or interlocking the elements by mechanical, thermal, or chemical means.

### **1860.07.03                Knitted Sock Geotextiles**

Knitted sock geotextiles shall be produced by interlooping one or more yarns, fibres, or filaments in a continuous tube. Knitted sock geotextiles are suitable only for wrapping of subdrain pipe.

### **1860.07.04                Seams**

When sections of geotextile are joined by sewing, the seam strength shall be at least 90% of the minimum tensile strength requirement for the class of geotextile specified in the Contract Documents.

Seams joining two sections of geotextile shall be sewn with thread meeting the material requirements for the geotextile or, shall be bonded by thermal or chemical means.

### **1860.07.05                Physical Requirements**

#### **1860.07.05.01            Woven and Non-Woven Geotextiles**

Woven and non-woven geotextiles are classified as either Class I or Class II and shall meet the physical property requirements shown in Table 1.

#### **1860.07.05.02            Knitted Sock Geotextiles**

Knitted sock geotextiles shall meet the physical property requirements shown in Table 2.

#### **1860.07.05.03            Temporary Silt Fence**

Geotextiles for temporary silt fence shall be woven or non-woven and shall meet the physical property requirements shown in Table 3.

### **1860.07.06                Protection during Shipment and Storage**

Geotextiles shall be protected against excessive UV exposure and contamination from dirt, dust, moisture, and any other deleterious materials, until they are installed. All geotextiles shall be wrapped in an opaque protective covering from the time of manufacture to the time of installation. The geotextiles and protective wrapping shall be free of tears and punctures, upon delivery to the work.

Geotextiles intended to be covered by soil, rock, earth, or other materials shall not be exposed to direct sunlight for more than 72 hours following the removal of the protective wrap.

Geotextiles shall be protected from temperatures greater than 60 °C.

#### **1860.07.07 Identification**

Each roll of geotextile or geotextile-covered pipe or tubing shall be clearly marked according to ASTM D 4873 with a permanent, legible identification tag or label either on the protective wrap or the inner core as applicable, or affixed to a geotextile-covered pipe or tubing. Product labels shall show the name of the manufacturer or supplier, product number, type, Class, roll number, and date of manufacture.

For Class I and Class II geotextiles, the product label requirements stated in the paragraph above, shall be waived for geotextiles certified by the BNQ according to BNQ 7009-910 for the requirements specified in the Materials and Production sections. BNQ-certified geotextiles shall bear the "BNQ" mark of conformity, the BNQ Product Designation, as specified in Table 1, as well as all other identification marks specified by BNQ.

### **1860.08 QUALITY ASSURANCE**

#### **1860.08.01 General**

When the Owner has elected to carry out QA testing to ensure that material used in the Work is according to the requirements of this specification, applicable geotextiles shall be sampled and tested according to the methods identified in Tables 1, 2, or 3, at the following rates:

- a) For Class I or II geotextile, one sample per 10,000 m<sup>2</sup> of installed product.
- b) For knitted sock geotextile, one sample per 10,000 m of installed subdrain pipe wrapped with knitted sock geotextile.
- c) For temporary silt fence geotextile, one sample per 10,000 m of silt fence barrier installed.

When the quantity of a geotextile is less than the lot size specified above, a minimum of one QA sample per each geotextile type shall be tested to verify that the material meets the requirements of this specification.

As specified elsewhere in the Contract Documents, the Contract Administrator shall be allowed access to all sampling locations and reserves the right to request a QA sample at any time without notice to the Contractor.

Testing shall be carried out at a laboratory designated by the Owner. The Owner shall be responsible for all costs associated with QA testing.

#### **1860.08.02 Sampling**

##### **1860.08.02.01 General**

QA sampling shall be carried out by the Contractor, in the presence of the Contract Administrator.

Sampling shall be according to ASTM D 4354 and as specified in the Contract Documents.

All QA samples shall be duplicate samples with both samples taken side-by-side.

Each sample shall be rolled and placed into separate UV-protective containers (e.g., sealed cardboard box or opaque plastic bag). If a rolled sample is too large to fit within a UV-protective container, it may be folded in a manner that minimizes the number of folds required to fit the sample into the container.

Each sample shall be accompanied with a copy of the roll label or identification tag, as well as the appropriate contract-related information and testing requirements, as specified in the Contract Documents. All such information shall be placed in a moisture-proof envelope directly attached to each UV-protective container.

Where security bags and seals are required, each UV-protective container shall be placed within a separate security bag sealed by the Contract Administrator.

#### **1860.08.02.02            Sample Size, Preparation, and Marking**

Samples of Class I and Class II geotextiles shall be the full width of the roll and at least 2.0 meters in length in the machine direction.

Samples of temporary silt fence geotextile and knitted socks shall be a minimum of 3.0 m<sup>2</sup> in area.

When samples are taken from a roll of material for testing, at least a full lat of the material from that roll shall be discarded prior to sampling.

All samples shall be completely dry, free of damage, dust, or other contamination, at all times. Any samples that have been allowed to become moist or wet shall be air-dried in a protected place, away from direct sunlight until they are completely dry, prior to packaging.

All samples shall be permanently marked with the machine direction.

For temporary silt fence geotextile that is attached to wooden stakes, the wooden stakes shall be carefully removed to avoid any tearing of the geotextile and the stakes discarded. The area within 150 mm of each of the stakes that were removed, shall then be permanently marked by crosshatching, to ensure that such areas are not used for testing.

#### **1860.08.03            Acceptance**

When QA testing has been carried out, QA test results shall be used for acceptance purposes.

#### **1860.08.04            Referee Testing**

When QA test results do not meet the requirements of this specification, the Contractor has the option of invoking referee testing for the test result or results that failed to meet the requirements, as long as a duplicate QA sample is available for testing.

The Contractor shall notify the Contract Administrator, in writing, invoking this option within 5 Business Days following notification of unacceptable material. The notification shall include the type and, where applicable, the class of geotextile, as well as the specific attribute or attributes for which the referee testing is being requested.

Referee testing shall be carried out, as specified herein and elsewhere in the Contract Documents.

The Owner shall select a referee laboratory, within 5 Business Days following the Contractor's notification to invoke referee testing.

The Contractor may observe the testing, at no additional cost to the Owner. The Contract Administrator shall notify the Contractor a minimum of 5 Business Days in advance of the date of referee testing. Provided that such notice was given, referee testing shall be carried out regardless of the absence of observers.

Observers shall follow the referee laboratory protocols for access to the premises and testing equipment and shall not unnecessarily impede the progress of the testing. Observers shall be permitted to validate sample identification and view sample condition. Subject to safety requirements, test method, and equipment limitations, Observers shall be permitted to observe test procedures, take notes, view equipment readings, and review completed work sheets while in attendance.

Concerns with sample condition or sample identification shall be made known prior to commencement of the referee testing. Comments on deviations from the applicable test method shall be made at the time of testing. Unresolved concerns shall be specific in nature and submitted, in writing, to the laboratory's designated representative and other observers, at the time of testing.

Referee test results shall be binding on both the Owner and the Contractor.

When a referee test result shows that the materials are in accordance with the physical property requirements of this specification, then the material represented by that test result shall be accepted.

When a referee test result shows that the material does not meet the physical property requirements of this specification, then the material represented by that test result, including any material already in the Work, shall be considered rejectable.

The Owner shall be responsible for the cost of referee testing, provided that the referee test results show that the geotextile meets the applicable requirements of this specification. Otherwise, the Contractor shall be responsible for the cost of referee testing.

## **1860.09                    OWNER PURCHASE OF MATERIAL**

### **1860.09.01                General**

Geotextiles supplied to the Owner under this specification shall be of the type, Class, and FOS range as specified in the Contract Documents. Material not meeting the requirements of this specification may be rejected by the Owner.

### **1860.09.02                Measurement and Payment**

Payment at the price specified in the Contract Documents, in square metres, shall be for the supply of geotextiles delivered to the destination on the date and time specified.

Rejected material shall be replaced at no additional cost to the Owner.

**TABLE 1**  
**Physical Property Requirements for Woven and Non-Woven Geotextiles**

Property	Test Method	Unit	Geotextile Class			
			Class I		Class II*	
			Woven	Non-Woven	Woven	Non-Woven
			BNQ Product Designation			
			OPSS 1860-I-W	OPSS 1860-I-N	OPSS 1860-II-W	OPSS 1860-II-N
Tensile strength, MARV, minimum	ASTM D 4632/D 4632M	N	800	350	1100	700
Tear strength, MARV, minimum	ASTM D 4533/D 4533M	N	300	180	400	250
Puncture strength, MARV, minimum	ASTM D 6241	N	1650	990	2200	1375
Permittivity, minimum	ASTM D 4491/D 4491M, Method A	s <sup>-1</sup>	0.05			
Filtration opening size (FOS)	CAN/CGSB 148.1, Method No. 10	μ	As specified in the Contract Documents			
Ultraviolet stability, minimum	ASTM D 4355	%	50% retained tensile strength at 500 hours			

*\*Note: A Class II Woven geotextile may be used to replace a Class I Woven geotextile or a Class II Non-Woven geotextile may be used to replace a Class I Non-Woven geotextile, as long as the geotextile being proposed for use meets the requirements for Filtration Opening Size (FOS), according to CAN/CGSB 148.1, Method No. 10, as specified in the Contract Documents.*

**TABLE 2**  
**Physical Property Requirements for Knitted Sock Geotextiles**

Property	Test Method	Acceptance Requirements
Puncture resistance, N	ASTM D 6241	800
FOS, maximum, μm	CAN/CGSB 148.1, Method No. 10	As specified in the Contract Documents
Permittivity, minimum, s <sup>-1</sup>	ASTM D 4491/D 4491M, Method A	2.75

**TABLE 3**  
**Physical Property Requirements for Temporary Silt Fence Geotextiles**

Property	Test Method	Unit	Supported Silt Fence	Unsupported Silt Fence	
				Woven	Non-Woven
Maximum post spacing	-	m	1.2	2.0	1.2
Tensile strength, MARV, minimum	ASTM D 4632/D 4632M	N	400	550	
Permittivity, minimum	ASTM D 4491/D 4491M	s <sup>-1</sup>	0.05		
Filtration Opening Size (FOS), maximum	CAN/CGSB 148.1, Method No. 10	µm	As specified in the Contract Documents		
Ultraviolet stability, minimum	ASTM D 4355/D 4355M	%	70% retained tensile strength at 500 hours		

**Appendix 1860-A, November 2018  
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS**

**Note:** This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

**Designer Action/Considerations**

The Owner should specify the following in the Contract Documents:

- Class, type (e.g., woven or non-woven), and FOS range of the geotextile. (1860.09.01)

The designer may consider reducing the sampling frequency for larger quantities of geotextile. (1860.08.01)

The designer should be aware that higher strength materials than those specified in Table 1 are available for specific applications.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

**Related Ontario Provincial Standard Drawings**

OPSD 206.050	Subdrain Pipe Connection and Outlet
OPSD 207.030	Concrete and Composite Pavement on Open Graded Drainage Layer
OPSD 207.041	Subdrain Pipe Open Graded Drainage Layer
OPSD 207.044	Subdrain Pipe Connection and Outlet Open Graded Drainage Layer
OPSD 216.021	Subdrain Pipe Connection and Outlet
OPSD 219.110	Light-Duty Silt Fence Barrier
OPSD 219.130	Heavy-Duty Silt Fence Barrier
OPSD 219.131	Heavy-Duty Wire-Backed Silt Fence Barrier
OPSD 219.210	Temporary Rock Flow Check Dam
OPSD 219.211	Temporary Rock Flow Check Dam Flat Bottom Ditch
OPSD 219.231	Temporary Berm Barrier for Slope Drain
OPSD 219.240	Sediment Trap for Dewatering
OPSD 219.260	Turbidity Curtain
OPSD 219.261	Turbidity Curtain Seam Detail
OPSD 802.013	Flexible Pipe Embedment and Backfill Rock Excavation
OPSD 802.014	Flexible Pipe Embedment in Embankment Original Ground: Earth or Rock
OPSD 802.023	Flexible Pipe Arch Embedment and Backfill Rock Excavation
OPSD 802.024	Flexible Pipe Arch Embedment in Embankment Original Ground: Earth or Rock
OPSD 802.033	Rigid Pipe Bedding, Cover, and Backfill rock Excavation
OPSD 802.034	Rigid Pipe Bedding and Cover in Embankment Original Ground: Earth or Rock
OPSD 802.053	Horizontal Elliptical Rigid Pipe Bedding, Cover, and Backfill Rock Excavation
OPSD 802.054	Horizontal Elliptical Rigid Pipe Bedding and cover in Embankment Original Ground: Earth or Rock
OPSD 810.010	General Rip-Rap Layout for Sewer and Culvert Outlets
OPSD 810.020	General Rip-Rap Layout for Ditch Inlets