320.01 SCOPE

This specification covers the requirements for materials, construction, and testing of asphalt cement and Portland cement treated open graded drainage layer.

320.01.01 Specification Significance and Use

This specification has been developed for use in provincial- and municipal-oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities and the Ontario Ministry of Transportation.

Use of this specification or any other specification shall be according to the Contract Documents.
320.01.02 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.

320.02 REFERENCES

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

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 to the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

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

**Ontario Provincial Standard Specifications, Construction**

- OPSS 310 Hot Mix Asphalt
- OPSS 313 Hot Mix Asphalt - End Result
- OPSS 350 Concrete Pavement and Concrete Base

**Ontario Provincial Standard Specifications, Material**

- OPSS 1003 Aggregates - Hot Mix Asphalt
- OPSS 1103 Emulsified Asphalt
- OPSS 1150 Hot Mix Asphalt
- OPSS 1151 Superpave and Stone Mastic Asphalt Mixtures
- OPSS 1301 Cementing Materials
- OPSS 1302 Water
- OPSS 1350 Concrete - Materials and Production
320.03 DEFINITIONS

For the purpose of this specification, the definitions in OPSS 313 and OPSS 350 and the following definitions apply:

**Delineator** means material used to delineate between Portland cement treated open graded drainage layer and the overlying concrete slab to facilitate measurement of the slab thickness.

**Design Lift Thickness** means the thickness in millimetres of the OGDL lift as specified in the Contract Documents.

**Drainage System** means the drainage layer, subdrains, and the lateral outlets.

**Mixture, Mix** means open graded drainage layer material treated with either asphalt cement or Portland cement.

**Open Graded Drainage Layer (OGDL)** means a rapid draining layer located within the pavement structure that is covered either by concrete pavement, concrete base, or hot mix asphalt pavement and overlies the granular base course. The OGDL can be either Portland cement treated or asphalt cement treated.

**Porosity of OGDL** means the ratio of the volume of voids to total volume of OGDL as measured by LS-627.

320.04 DESIGN AND SUBMISSION REQUIREMENTS

320.04.01 Submission Requirements

The Contract Administrator shall be provided with the following data at least 14 Days prior to placement of the OGDL:

a) Aggregate source.

b) From a laboratory meeting the requirements of the Laboratory Requirements clause:

   i. Aggregate test results for the required physical properties.
   ii. Test results for aggregate gradation.

   c) Volumetric proportions for the OGDL mixture.
d) The type of plant to be used for OGDL mixture production, including the plant location for the Contract.

e) The method of delineation to be used.

320.04.01.01 Laboratory Requirements

An acceptable laboratory to conduct tests for aggregate physical properties shall be one that holds a current certificate from the Canadian Council of Independent Laboratories (CCIL) as Type D for the applicable test methods and also participates in the annual MTO Proficiency Sample Testing Program for the specific tests.

An acceptable laboratory, to conduct tests for aggregate gradation according to LS-602 and materials finer than 75 µm by washing of the aggregates according to LS-601, shall be one that holds a current certificate from CCIL as Type C. Testing for LS-602 and LS-601 shall be conducted by qualified laboratory staff who hold a valid certificate from CCIL in aggregate testing.

Equivalent alternate laboratory and technician certifications or laboratory proficiency sample testing programs may be used to demonstrate similar requirements to those requested below provided they are acceptable to the Owner.

320.05 MATERIALS

320.05.01 General

Materials for the mixture shall be according to OPSS 313 or OPSS 350, except as amended by the following.

320.05.02 Aggregates

Aggregate for the mixture shall consist of 100% crushed particles produced by crushing bedrock material. Reclaimed materials or crushed reclaimed materials shall not be used.

Physical property requirements shall be according to the requirements for Superpave 19.0 binder course in Table 7 of OPSS 1003, except that Note 3 in Table 7 shall not apply. The gradation requirements shall be according to Table 1.

320.05.03 Asphalt Cement Treated OGDL

Asphalt cement shall be according to the requirements for performance graded asphalt cement specified in the Contract Documents. The delivery, handling, and storage of asphalt cement shall be according to the manufacturer's requirements. The percentage by mass of asphalt cement in the mixture shall be 1.8 ± 0.2%. The mix shall be prepared according to the requirements of OPSS 1151. Porosity of OGDL shall be 0.25 to 0.50, determined according to LS-627.

320.05.04 Portland Cement Treated OGDL

Portland cement including the delivery, handling, and storage shall be according to OPSS 1301. The mixture shall meet the following requirements:

a) The cementing material shall be Type 10 Portland cement. No supplementary cementing materials shall be included in the mix.

b) The mix shall be produced with a water to cement ratio of 0.37 ± 0.01.
c) The mix shall contain 120 ± 10 kg/m³ of Portland cement.

d) Water shall be according to OPSS 1302.

Porosity of OGDL shall be 0.25 to 0.50, determined according to LS-627.

320.05.05 Delineator

The delineator shall consist of undiluted SS-1 emulsified asphalt according to OPSS 1103 diluted with an equal volume of water.

320.06 EQUIPMENT

320.06.01 Production Equipment

320.06.01.01 Asphalt Cement Treated OGDL

The mix shall be produced using equipment according to the requirements of OPSS 1150.

320.06.01.02 Portland Cement Treated OGDL

The production of the OGDL mixture shall be completed using a central mixing plant or dry batch plant according to OPSS 1350 and capable of accurately proportioning aggregate, Portland cement, and water.

320.06.02 Paving Equipment

320.06.02.01 Asphalt Cement Treated OGDL

Paving equipment shall be according to OPSS 310.

320.06.02.02 Portland Cement Treated OGDL

Placing equipment shall be according to OPSS 313 or OPSS 350. Placing equipment used shall employ adequate mixing equipment to ensure a homogenous material is placed uniformly across the lane to the required grade and design lift thickness specified in the Contract Documents.

320.06.03 Rollers

Class S rollers shall be according to OPSS 310, except as amended by the following requirements:

a) The drum widths of the tandem roller shall each be between 1.9 and 2.4 m.

b) The front drum width of the three-wheel roller shall be between 1.9 and 2.4 m.

c) Rollers shall have a mass of between 9 and 11 tonnes.

320.06.04 Straight Edge

The straight edge shall be 3 m in length, metal, and have a level recessed in its upper edge parallel to the lower edge.
320.07 CONSTRUCTION

320.07.01 Operational Constraints

OGDL mixture shall not be placed in the rain. Precautions shall be taken to protect plastic Portland cement treated OGDL from rain.

Portland cement treated OGDL mixture shall be allowed to cure until the OGDL has gained sufficient strength to support the paving equipment and for a minimum of 48 hours prior to placing the overlying pavement. Protection shall be provided during the curing period.

Traffic shall not be permitted on the OGDL with the exception of sampling equipment, equipment for the application of delineator, and the paving train during the placement of the overlying pavement.

Contamination of the OGDL by tracking, spilling, or placing of mud or other contaminants onto the OGDL shall not be permitted.

All OGDL shall be covered with the overlying pavement within 30 Days following placement.

The drainage system shall be operational prior to the placement of the OGDL.

320.07.02 Portland Cement Treated OGDL Trial Section

The work required for construction shall be according to OPSS 313, except as amended by the following:

The ability to successfully mix, handle, place, and compact Portland cement treated OGDL mixture shall be demonstrated in the presence of the Contract Administrator prior to placing OGDL mixture. The method of delineation to be used shall also be demonstrated, within the trial section.

A 100 m long trial section consisting of one or two full paving lane widths shall be constructed. Only the material, equipment, and methodology used and approved in the trial section shall be used in the Contract. The location of the trial section shall be proposed by the Contractor. Permission to place the trial section in the proposed location shall be granted or denied by the Contract Administrator. A minimum of 48 hours notice shall be given to the Contract Administrator prior to placing the trial section.

In lieu of a trial section, the Contract Administrator may accept evidence that the Contractor has demonstrated the ability to successfully mix, handle, place, and compact Portland cement treated OGDL mixture with the same aggregate source and mixture proportioning, equipment, placing crew, and methodology to meet the Contract requirements for placing Portland cement treated OGDL mixture on a Contract within the last 8 months.

Provided the OGDL trial section meets the requirements of this specification, the trial section shall be considered acceptable. Otherwise, additional trial sections shall be repeated until the OGDL meets the requirements of this specification. A maximum of two trial sections shall be permitted within the Contract limits. Any additional trial sections are to be placed outside the Contract limits.

The trial section shall be divided into four equal sections along its length. A minimum of 2 Days after placing the OGDL, one full depth intact 150 mm nominal diameter core shall be taken at a random location selected by the Contract Administrator from each of the four sections in the trial section.

Core samples shall be inspected by the Contract Administrator and may be tested at the discretion of the Contract Administrator to evaluate the trial for consistency, thickness, and porosity of OGDL.

Permission to place the OGDL mixture shall be granted or denied by the Contract Administrator within 3 Business Days of receipt of trial section cores by the designated laboratory.
320.07.03 Quality Control

320.07.03.01 Sampling and Testing of Aggregate

The Contractor shall be responsible for all quality control (QC) sampling and testing to ensure that the aggregate incorporated into the OGDL meets the physical property and the gradation requirements of the Aggregates subsection. Testing shall be carried out by a laboratory that meets the requirements of the Laboratory Requirements clause.

Testing demonstrating conformance of the aggregates with the aggregate gradation requirements shall be conducted at a frequency chosen by the Contractor.

Testing demonstrating conformance of the aggregates with the physical property requirements shall be completed for each quantity of material produced according to the following schedule:

a) For the first 20,000 tonnes produced.

b) For the next 20,000 tonnes produced.

c) For each 40,000 tonnes produced thereafter.

Further testing is required whenever material is produced from a new source or a new bench in a quarry or whenever a significant change in aggregate production or material occurs that may affect the quality of the material.

For Portland cement treated OGDL, the Contractor shall maintain the correct water cement ratio by monitoring the aggregate moisture content during mix production. These monitoring records shall be available to the Contract Administrator upon request.

320.07.04 Longitudinal and Transverse Joints

Longitudinal and transverse joints shall be according to OPSS 313, except that painting of joints is not required.

320.07.05 Rolling

Only static rollers or vibratory rollers in the static mode shall be used. Compaction shall consist of three to five passes of a Class S roller, irrespective of the production rate. Compaction of the Portland cement treated OGDL shall be carried out immediately after placement.

Aggregate pick-up by the rollers shall be minimized. When water is used on the roller drums to prevent aggregate pick-up, free water shall not be allowed to fall onto the Portland cement treated OGDL surface.

320.07.06 Surface Tolerances

The surface shall be shaped and compacted so the finished surface does not deviate more than 10 mm from the grade and cross-section specified in the Contract Documents. The surface is to be such that when tested with a straight edge placed in any direction on the surface, there shall not be a gap greater than 5 mm between the bottom of the straight edge and the surface of the OGDL. Grading or milling, or both, of the finished surface shall not be permitted.

320.07.07 Delineation

A delineator shall be placed on the Portland cement treated OGDL prior to placement of the overlying concrete pavement or concrete base.
The delineator shall be applied using self-propelled or towed pressure distributors capable of applying the product at a rate of 0.35 kg/m² in a continuous and uniform manner over all of the OGDL to be overlaid. The distributors shall be equipped with a volume metering device of sufficient sensitivity to measure the quantity of delineator dispensed in litres.

320.07.08 Sampling

320.07.08.01 Core Sampling

Prior to the placement of the overlying pavement layer, one intact 150 mm nominal diameter core shall be taken for the full depth of the OGDL at a random location selected by the Contract Administrator from each sublot. Cores shall be taken in a manner to avoid sample damage. If an intact and undamaged core cannot be obtained, the sample can be taken by saw cutting an intact sample with minimum dimensions of 140 by 140 mm square and maximum dimensions of 145 by 145 mm square. The saw cut sample must be intact and undamaged.

320.07.08.02 Labelling

The Contract Administrator is to be advised when each sample is to be taken and the Contract Administrator shall apply security seals to samples taken for quality assurance (QA) testing. Samples shall be placed in a suitable container to protect the sample integrity and shape during transportation and until testing. Each sample shall be labelled with the sample identification number, Contract number, station location, and offset from the centreline of the roadway. The sample identification numbers shall be specified by the Contract Administrator.

320.07.08.03 Delivery

The samples shall be delivered to a laboratory designated by the Contract Administrator within 24 hours of sampling. These samples shall be transported in a manner that avoids damage to the samples.

320.07.08.04 Repair of Sampling Locations

Immediately after sampling, each sample hole shall be filled with OGDL aggregate up to the top of the surrounding OGDL.

320.07.09 Management of Excess Material

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

320.08 QUALITY ASSURANCE

320.08.01 General

QA testing shall determine the thickness and porosity of OGDL samples. QA testing shall be carried out by the Contract Administrator for purposes of ensuring that material placed in the work is according to the requirements of this specification. The Contract Administrator shall be allowed access to all sampling locations and reserves the right to request a QA sample at any time. The QA test results shall be provided to the Contractor within 24 hours of receipt of the test results by the Contract Administrator.

320.08.02 Acceptance

Acceptance of the OGDL is based on surface appearance, surface tolerance, thickness, and porosity.
320.08.02.01 Acceptance of Surface Appearance

Surface appearance shall be assessed by the Contract Administrator based on visual surveys. The finished OGDL surface shall have a uniformly open texture and be free from loose aggregates. The OGDL is rejectable if over a 100 m² section:

a) a single appearance irregularity exceeds 1 m², or
b) the combined area of multiple irregularities exceeds 2 m².

OGDL that is rejected for appearances shall be repaired. OGDL that is repaired shall be re-decisioned according to the Repairing and Re-Decisioning subsection.

320.08.02.02 Acceptance of Surface Tolerance

The surface tolerance of any OGDL surface shall be such that when tested with a straight edge placed anywhere on the OGDL surface, including the edge of the OGDL, in any direction on the surface, except across the crown, there shall not be a gap between the bottom of the straight edge and the surface of the OGDL greater than 5 mm. All areas not meeting the surface tolerance requirements shall be repaired and decisioned according to the Repairing and Re-Decisioning subsection.

320.08.02.03 Acceptance of Thickness

The Contract Administrator shall test one sample from each sublot to determine the thickness of the OGDL in accordance with ASTM C 174/C 174M. The QA laboratory shall report thickness test results within 3 Working Days of receipt of the samples. The test results for each sublot shall be used to compute the lot mean calculated to one decimal place for thickness according to LS-100.

Thickness acceptance is based on the mean of the lot, provided no single sublot is deemed rejectable. A sublot is rejectable if the sublot thickness is less than 0.60 of the design lift thickness.

If the lot mean thickness is equal to or greater than the design lift thickness less 5.0 mm, the item shall be accepted without any price reduction for thickness.

If the lot mean thickness is less than the design lift thickness less 5.0 mm, but greater than or equal to 0.60 of the design lift thickness, the lot shall be subject to price reduction. The material shall be accepted provided the Contractor accepts a price reduction for thickness calculated using the pay factors in Table 2.

The lot is rejectable if the lot mean thickness is less than 0.60 of the design lift thickness.

The Contract Administrator shall determine if a rejectable sublot may remain in the work without repairs. If a lot is rejectable, the rejectable sublots shall be repaired. If a lot is classified as acceptable or for price reduction, the Contract Administrator may determine that a rejectable sublot can remain in the work without repair with the lot subjected to a price reduction. If the Contractor elects to repair the sublot in lieu of a price reduction or if the Contract Administrator determines that a rejectable sublot requires repair, the sublot shall be repaired and decisioned according to the Repairing and Re-Decisioning subsection.

320.08.02.04 Acceptance of Porosity

The QA laboratory shall test one sample from each sublot to determine the porosity of OGDL calculated to three decimal places according to LS-100. The test results for each sublot shall be used to compute the lot mean for porosity of OGDL.

The QA laboratory shall report to the Contract Administrator the porosity of OGDL test results within 14 Days of receipt of the samples.
Porosity of OGDL acceptance is based on the mean porosity of OGDL of the lot calculated to two decimal places according to LS-100, provided no single sublot is deemed rejectable. A sublot is rejectable if the porosity of OGDL is less than 0.200 or greater than 0.550.

If the lot mean porosity of OGDL is equal to or greater than 0.25 but less than 0.50, the item shall be accepted without any price reduction for porosity of OGDL.

If the lot mean porosity of OGDL is less than 0.25 and greater than or equal to 0.20 or is from 0.50 to 0.55, the lot shall be subject to a price reduction. The material shall be accepted provided the Contractor accepts a price reduction for porosity of OGDL calculated using the pay factors in Table 3.

The Contract Administrator shall determine if a rejectable sublot may remain in the work without repairs. If a lot is rejectable, the rejectable sublots shall be repaired. The lot is rejectable if the lot mean porosity of OGDL is less than 0.20 or greater than 0.55. When the Contract Administrator has determined that a rejectable sublot may remain in the work without repair, the lot shall be subjected to a payment adjustment. If the Contractor elects to repair the sublot in lieu of a payment adjustment or if the Contract Administrator determines that a rejectable sublot requires repair, the sublot shall be repaired and decisioned according to the Repairing and Re-Decisioning subsection.

320.08.03 Lot Size

After discussions with the Contractor and prior to the placement of the OGDL, the Contract Administrator shall establish the lot size and the number of sublots with a maximum sublot size of 4,000 m².

320.08.04 Repairing and Re-Decisioning

320.08.04.01 General

All repairs to OGDL shall be full lane or shoulder width and a sufficient length for the repair to be carried out employing the same equipment used during initial placement of the OGDL with the exception of repairs for surface deficiencies in surface tolerance.

Any OGDL identified by the Contract Administrator as contaminated shall be deemed rejectable and shall be repaired as specified herein.

320.08.04.02 Surface Appearance

Rejectable OGDL due to surface irregularities or contamination shall be removed and replaced.

320.08.04.03 Surface Tolerance

Where surface tolerances are exceeded, the deficiencies shall be corrected with an additional thickness of overlying surface material.

320.08.04.04 Thickness and Porosity

For each sublot that is rejectable due to thickness or porosity or both, the Contractor shall determine the limits of the rejectable OGDL based on additional sampling and testing.

For the rejectable sublot, the areas proposed to be retained by the Contractor shall comprise a new lot of OGDL for acceptance purposes. The number of sublots in the new lot shall be determined by the Contract Administrator. The unrepaired OGDL shall be decisioned in accordance with the Acceptance of Thickness clause or the Acceptance of Porosity clause or both, as appropriate.
New OGDL placed for repairs shall constitute a new lot of OGDL for acceptance purposes with sublots as follows:

a) 1 sublot for up to 100 m² of repairs.

b) 2 sublots for up to 500 m² of repairs.

c) 3 sublots for greater than 500 m² of repairs.

The maximum lot size for new OGDL used for repairs shall be 2,000 m².

320.09  MEASUREMENT FOR PAYMENT

320.09.01  Actual Measurement

320.09.01.01  Open Graded Drainage Layer

Measurement of OGDL shall be by area in square metres.

320.09.02  Plan Quantity Measurement

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

320.10  BASIS OF PAYMENT

320.10.01  Open Graded Drainage Layer - 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, except as otherwise specified herein.

Unacceptable trials, including trial mix, placement, removal, disposal, and testing, shall be at no extra cost to the Owner. Trials outside the Contract limits shall be at no extra cost to the Owner.

When test results show that either the thickness payment factor or porosity of OGDL payment factor for the lot is less than 1.000 and the Contractor is not required to or does not elect to repair the lot, the payment reduction for the lot shall be as follows.

\[(2.000 - PF_T - PF_P) \times \text{item price} \times \text{lot quantity}\]

For purposes of payment reduction, the term item price means the Contract price of the applicable tender item.
### TABLE 1  
Gradation Requirements (LS-602)

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percentage Passing By Dry Mass of Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5 mm</td>
<td>100</td>
</tr>
<tr>
<td>26.5 mm</td>
<td>95 - 100</td>
</tr>
<tr>
<td>19.0 mm</td>
<td>90 - 100</td>
</tr>
<tr>
<td>16.0 mm</td>
<td>65 - 100</td>
</tr>
<tr>
<td>13.2 mm</td>
<td>40 - 86</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>20 - 55</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>0 - 10</td>
</tr>
<tr>
<td>2.36 mm</td>
<td>0 - 5</td>
</tr>
<tr>
<td>75 μm</td>
<td>0 - 2</td>
</tr>
</tbody>
</table>

### TABLE 2  
Thickness Payment Factors

<table>
<thead>
<tr>
<th>Acceptance Criteria</th>
<th>Classification</th>
<th>Payment Factor, PFₜ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tₖ ≥ Tₗ - 5.0 mm</td>
<td>Acceptable</td>
<td>1.000</td>
</tr>
<tr>
<td>Tₗ - 10.0 mm ≤ Tₖ &lt; Tₗ - 5.0 mm</td>
<td>Payment Reduction</td>
<td>(5.0 + Tₖ)/Tₗ</td>
</tr>
<tr>
<td>0.60Tₗ ≤ Tₖ &lt; Tₗ - 10.0 mm</td>
<td>Payment Reduction</td>
<td>(10.0 + 1.5Tₖ)/Tₗ - 0.50</td>
</tr>
<tr>
<td>Tₖ &lt; 0.60Tₗ</td>
<td>Rejectable</td>
<td>(10.0 + 1.5Tₖ)/Tₗ - 0.50</td>
</tr>
</tbody>
</table>

Where:  
Tₗ is the OGDL design lift thickness specified in the Contract Documents in millimetres.  
Tₖ is the mean of the lot sample perpendicular height thickness in millimetres calculated to one decimal place according to LS-100.  
PFₜ is the payment factor for thickness calculated to three decimal places according to LS-100.

### TABLE 3  
Porosity of OGDL Payment Factors

<table>
<thead>
<tr>
<th>Acceptance Criteria</th>
<th>Classification</th>
<th>Payment Factor, PFₜ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 ≤ nₖ &lt; 0.50</td>
<td>Acceptable</td>
<td>1.000</td>
</tr>
<tr>
<td>0.20 ≤ nₖ &lt; 0.25</td>
<td>Payment Reduction</td>
<td>1 - 4(0.25 - nₖ)</td>
</tr>
<tr>
<td>0.50 ≤ nₖ ≤ 0.55</td>
<td>Payment Reduction</td>
<td>1 - 4(nₖ - 0.50)</td>
</tr>
<tr>
<td>nₖ &lt; 0.20</td>
<td>Rejectable</td>
<td>1 - 4(0.25 - nₖ)</td>
</tr>
<tr>
<td>nₖ &gt; 0.55</td>
<td>Rejectable</td>
<td>1 - 4(nₖ - 0.50)</td>
</tr>
</tbody>
</table>

Where:  
PFₚ is the payment factor for porosity of OGDL of the lot calculated to three decimal places according to LS-100.  
nₖ is the mean porosity of OGDL of the lot calculated to two decimal places according to LS-100.
Appendix 320-A, November 2010
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

Open Graded Drainage Layer (OGDL) is a premium pavement drainage layer that has the same structural equivalency as crushed granular base, but is designed to drain off any infiltrated surface water before it saturates the pavement structure. OGDL is recommended for use on major arterials and expressways with rigid and flexible pavements.

The designer should specify the following in the Contract Documents:

- The requirements for performance graded asphalt cement. (320.05.03)
- OGDL design lift thickness. (320.06.02.02)
- The required grade and cross-section. (320.07.06)

A minimum compacted thickness of 100 mm placed in a single lift is recommended for OGDL.

A minimum 100 mm thick layer of compacted Granular A as a filter layer should be placed under the OGDL to prevent migration of fines upward into the OGDL.

For flexible pavements, a minimum thickness of 160 mm of hot mix is recommended.

OGDL should be part of a high performance drainage system as detailed in the related Ontario Provincial Standard drawings.

For superelevated sections, it is necessary to have a collector drain only at the lower edge of pavement.

The drainage system including subdrain backfill, geotextile, and outlets should be constructed according to OPSS 405.

For inaccessible areas where conventional paving equipment cannot be used, (e.g., tapers and narrow widenings) the designer should consider specifying an alternate free draining base material such as Granular O, OGDL aggregate, or hand placed OGDL.

This is an end result type specification with payment adjustments for mean porosity and mean thickness. This specification allows the Contractor to choose asphalt cement treated or Portland cement treated OGDL, and includes requirements for Contractor quality control.

Specific clauses within the specification apply to either the asphalt cement treated or Portland cement treated OGDL.

Since the OGDL Porosity Test is a non-routine test, there are a limited number of laboratories capable of carrying out this test.

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 207.041 Open Graded Drainage Layer with Subdrain Pipe, Paved Shoulders
OPSD 207.044 Subdrain Pipe Connections and Outlets, for Open Graded Drainage Layer