

**Amendment to OPSS.MUNI 1010 (Nov 2013) –
Material Specification for
Aggregates – Base, Subbase, Select Subgrade, and Backfill Material**

OPSS 1010.03 DEFINITIONS

Section 1010.03 of OPSS.MUNI 1010 is amended by the addition of the following:

Class I means source of material is from (a) crushed concrete from runways, aprons and roadways, (b) rejected precast elements such as pipes and (c) crushed concrete from bridge and dam structures.

Class II means source of material is from crushed concrete from non-structural structures such as sidewalks, curbs, gutters and footings.

Class III means source of material is from (a) crushed concrete from washout or cleanout from concrete delivery trucks, (b) construction and demolition waste from buildings and (c) consumer waste such as bricks, cinder blocks, masonry and tiles.

Granular A means a set of requirements for dense graded aggregates meeting any of the requirements for Granular A Native, Granular A RCM or Granular A RAP.

Granular A Native means a set of requirements for dense graded aggregates produced by crushing bedrock or naturally formed deposits of sand, gravel and cobbles.

Granular A RCM means a set of requirements for dense graded recycled concrete material intended for use as bedding, embedment material and trench backfill around underground infrastructure.

Granular A RAP means a set of requirements for dense graded recycled asphaltic material intended for use as granular base within the pavement structure and/or related work within the road allowance.

50 mm Crushed Aggregate means a set of requirements for dense graded recycled material intended for use as granular base within the pavement structure.

OPSS 1010.04 SUBMISSION AND DESIGN REQUIREMENTS

OPSS 1010.04.01 Submission of Test Data

Subsection 1010.04.01 of OPSS.MUNI 1010 is amended by deleting the first paragraph in its entirety and replacing it with the following:

The Contractor shall have test results available for the aggregates to be used in the work. The QC testing records shall be made available to Contract Administrator at least five Working Days before the delivery of the material. Test results shall be submitted by either the stockpile/pit-run method or control chart method. All test data forms shall be legible.

OPSS.MUNI 1010 is amended by the addition of the following subsection:

OPSS 1010.04.02 Submission of RCM Test Data

The Quality Control plan shall form part of the submission requirements to the City, along with test results for recent and current production confirming that the production process is according to LS-624 providing consistent RCM material meeting specification requirements. Physical properties shall be confirmed by an independent, CCIL Type C (Aggregate Quality Control) and Type D (Aggregate Physical Property Laboratory) certified laboratory.

OPSS 1010.05 MATERIALS

OPSS 1010.05.02 Granular A, Granular M, and Granular S

Subsection 1010.05.02 of OPSS.MUNI 1010 is amended by deleting the entire section and replacing with the following:

Granular A shall meet the specifications of Granular A Native, Granular A RCM or Granular A RAP.

OPSS 1010.05.02.01 Granular A Native

Granular A Native produced by crushing one or more of the following:

- 1) Quarried bedrock.
- 2) Naturally formed deposits of sand, gravel and cobbles.

Subsection 1010.05.02 of OPSS.MUNI 1010 is amended by the addition of the following clause:

OPSS 1010.05.02.02 Granular A RCM

Granular A RCM produced from reclaimed concrete material and intended primarily for pipe bedding shall:

- 1) be from Class I and II sources only
- 2) contain up to 100 per cent by mass of crushed RCM only
- 3) not contain glass or ceramic material and

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- 4) not contain more than a combined total of 0.5 per cent by mass of deleterious material. Gypsum, gypsum plaster and wall board mix shall not be allowed in the mix.

Subsection 1010.05.02 of OPSS.MUNI 1010 is amended by the addition of the following clause:

OPSS 1010.05.02.03 Granular A RAP

Granular A RAP produced from reclaimed asphalt pavement material:

- 1) be from Class I and II sources only
- 2) may contain up to 100 per cent by mass of crushed RCM but shall not contain more than 30 per cent of RAP by mass
- 3) shall not contain glass or ceramic material and
- 4) shall not contain more than a combined total of 0.5 per cent by mass of deleterious material. Gypsum, gypsum plaster and wall board mix shall not be allowed in the mix.

Subsection 1010.05.03 of OPSS.MUNI 1010 is amended by the addition of the following clause:

OPSS 1010.05.03.06 50 mm Crushed Aggregate

50 mm crushed aggregate:

- 1) be from Class I and II sources only
- 2) may contain up to 100 per cent by mass of crushed RCM but shall not contain more than 30 per cent of RAP by mass
- 3) shall not contain glass or ceramic material and
- 4) shall not contain more than a combined total of 0.5 per cent by mass of deleterious material. Gypsum, gypsum plaster and wall board mix shall not be allowed in the mix.

50 mm crushed aggregate shall meet the physical requirements shown in Table 1 and gradation requirements shown in Table 2.

OPSS 1010.07 PRODUCTION

OPSS 1010.07.02.01 General

Clause 1010.07.02.01 of OPSS.MUNI 1010 is amended by the addition of the following paragraphs:

All Contractors or suppliers producing RCM for City construction projects shall provide a detailed Quality Control plan covering RCM production and placement as part of their materials submissions. The QC plan shall describe the Contractor's or suppliers processes for the control, acceptance and documentation of sources of old concrete and identify how the sources of old concrete are controlled during delivery to ensure they are from a suitable source. Class III source materials are not allowed.

Describe the production and physical properties testing (tests and frequency) that are conducted by the Contractor or supplier to ensure that the RCM meets the City's requirements; including the absence of gypsum, gypsum plaster and wall board mix; and including a process to control excessive fine particles, RAP and building demolition wastes. Washout or cleanout from concrete delivery trucks is prohibited.

The Contractor or supplier shall provide a written certificate to the Contract Administrator expressly stating that no building demolition wastes have been used in the production of the RCM granular base and subbase. The certificate shall state that the RCM supplied contains sulphate concentrations less than or equal to 5000 µg/g. The sampling and testing frequency from the stockpile would commence with the first testing to be performed based on one test for every 1000 tonnes of production. Ten (10) samples/tests, based on one for every 1000 tonnes, are required to establish that material is considered to be under control meeting all specification requirements. The subsequence testing and sampling can be performed less frequently at one test for every 5000 tonnes.

Contractors or suppliers shall obtain and submit samples to a Canadian Association for Environmental Analytical Laboratories (CAEAL) certified third party external analytical laboratory for sulphate concentration testing as part of their ongoing QC/process control program, and submit the test results to the City as part of its approval submission.

OPSS 1010.08 QUALITY ASSURANCE

OPSS 1010.08.04 Acceptance

Subsection 1010.08.04 of OPSS.MUNI 1010 is amended by deleting the fourth paragraph in its entirety and replacing it with the following:

The Contractor shall cease using the non-complying materials and at the discretion of the Contract Administrator, remove the unacceptable materials, including the unacceptable materials that has already been placed and compacted. No payment shall be made for unacceptable materials.

OPSS 1010.08.05 Referee Testing

Subsection 1010.08.05 of OPSS.MUNI 1010 is amended by deleting the first sentence in the second paragraph in its entirety and replacing it with the following:

The Contract Administrator shall select a referee laboratory within three business days following the Contractor's notification to invoke referee testing.

TABLE 1 Physical Property Requirements

Table 1 of OPSS.MUNI 1010 is amended by the addition of column *50 mm Crushed Aggregate* as follows:

Table 1: Physical property requirements

| Laboratory test | MTO test number | Granular O | Granular A | Granular S | Granular B Type I and Type II | Granular B | 50 mm crushed aggregate | Select sub grade material |
|---|------------------|------------|------------------|-----------------|-------------------------------|------------------|-------------------------|---------------------------|
| coarse aggregate petrographic requirement | LS-609 | Note a | Note a Note b | Note a | Note a Note b | Note a Note b | Note b | Note b |
| freeze-thaw loss, % maximum | LS-614 | 15 | n/a | n/a | n/a | n/a | n/a | n/a |
| fine aggregate petrographic requirement | LS-616 LS-709 | | | | Note c | | | |
| micro-deval abrasion coarse aggregate loss, % maximum | LS-618 | 21 | 25 | 25 | 30 ^d | 25 | 25 | 30 ^d |
| micro-deval abrasion fine aggregate loss, % maximum | LS-619 | 25 | 30 | 30 | 35 | 30 | 30 | n/a |
| plasticity index | LS-704 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| percent crushed, minimum | LS-607 | 100 | 50 | 50 | n/a | 50 | 50 | n/a |
| 2 or more crushed faces, % minimum | LS-617 | 85 | n/a | n/a | n/a | n/a | n/a | n/a |
| Asphalt Coated Particles, % maximum | LS-621 | n/a | 30 ^f | 30 ^d | Note e | 30 | 30 | n/a |

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- Note a: Granular A, B Type I, or M may contain up to 15% by mass of crushed glass and ceramic material combined.
- Note b: Granular A, B Type I, M, and S shall not contain more than 1% by mass of deleterious material. Granular O, Granular B Type II and SSM shall not contain more than 0.1% by mass of wood. Petrographic classification of rock type need not be reported. This requirement is only to be reported when such material is present.
- Note c: Test required for materials north of the French and Mattawa Rivers only. For materials with greater than 5.0% passing the 75µm sieve, the amount of mica passing the 150µm sieve and retained on the 75µm sieve, shall not exceed 10% of the material in that sieve fraction unless either testing according to LS-709 determines permeability values to be greater than 1.0×10^{-4} cm/s or field experience show satisfactory performance. Prior data demonstrating compliance with this requirement will be acceptable provided such testing has been done within the past five years and that field performance of these materials has been satisfactory.
- Note d: The coarse aggregate Micro-Deval abrasion loss test requirements will be waived if the material has more than 80% passing the 4.75 mm sieve.
- Note e: Granular B Type I may contain up to 30% asphalt coated particles. Granular B Type II shall not contain RAP or asphalt coated products.
- Note f: RAP up to 30% by mass not applicable to Granular A and Granular A RCM.

TABLE 2 Gradation Requirements – Percent Passing

Table 2 of OPSS.MUNI 1010 is amended by the addition of column *50 mm Crushed Aggregate* as follows:

Table 2: Gradation requirements – percent passing

| MTO test number Sieve | | Granular | | | | | | | Select subgrade material |
|------------------------------|---------|----------|-------------------------|--------------------------|---------------------|---------|-------------------------|---------|--------------------------|
| | | | | | B ^a | | 50 mm crushed aggregate | | |
| | | | | | Type I ^b | Type II | | | |
| | | O | A | S | | | M | | |
| LS-602 | 150 mm | n/a | n/a | n/a | 100 | n/a | n/a | n/a | 100 |
| | 106 mm | n/a | n/a | n/a | n/a | 100 | n/a | n/a | n/a |
| | 37.5 mm | 100 | n/a | n/a | n/a | n/a | n/a | 70-100 | n/a |
| | 26.5 mm | 95-100 | 100 | 100 | 50-100 | 50-100 | n/a | n/a | 50-100 |
| | 19 mm | 80-95 | 85-100 (87-100*) | 90-100 | n/a | n/a | 100 | 50-80 | n/a |
| | 16 mm | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| | 13.2 mm | 60-80 | 65-90 (75-95)* | 75-100 | n/a | n/a | 75-95 | n/a | n/a |
| | 9.5 mm | 50-70 | 50-73 (60-83)* | 60-85 | n/a | n/a | 55-80 | 20-60 | n/a |
| | 4.75 mm | 20-45 | 35-55 (40-60)* | 40-60 | 20-100 | 20-55 | 35-55 | n/a | 20-100 |
| | 1.18 mm | 0-15 | 15-40 | 20-40 | 10-100 | 10-40 | 15-40 | 15-40 | 10-100 |
| | 300 µm | n/a | 5-22 | 11-25 | 2-65 | 5-22 | 5-22 | n/a | 5-95 |
| | 150 µm | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 2.0-65 |
| | 75 µm | 0-0.5 | 2.0-8.0 (2.0-10.0**) | 9.0-15.0 (9.0-17.0**) | 0-8.0 (0-10.0**) | 0-10.0 | 2.0-8.0 (2.0-10.0**) | 3.0-8.0 | 0-25.0 |

Note a: Where Granular B is used for granular backfill for pipe sub drains, 100% of the material shall pass the 37.5mm sieve.

Note b: Where RAP is included in Granular B Type I, 100% of the RAP shall pass the 75mm sieve. Conditions in Note 1 supersede this requirement.

* Where the aggregate is obtained from an air-cooled blast furnace slag source.

** Where the aggregate is obtained from a quarry or an air-cooled blast furnace slag or nickel slag source.

TABLE 3 Minimum Sampling and Testing Frequency for Control Chart Use

Table 3 of OPSS.MUNI 1010 is amended by the addition of row *50 mm Crushed Aggregate* as follows:

Table 3: Minimum sampling and testing frequency for control chart use

| Material | Frequency for Type 1 control chart | Frequency for Type 2 control chart |
|-------------------------|---------------------------------------|---------------------------------------|
| | t | t |
| Granular A, M and S | 2500 | 5000 |
| Granular B and SSM | 5000 | 10,000 |
| Granular O | 2000 | 4000 |
| 50 mm Crushed Aggregate | 5000 | 10,000 |

TABLE 4 Sample Size

Table 4 of OPSS.MUNI 1010 is amended by the addition of row *50 mm Crushed Aggregate* as follows:

Table 4: Sample size

| Material | Minimum mass of individual field samples |
|---|--|
| | kg |
| Granular A, S, M, and O | 25 |
| Granular B and SSM | 50 |
| Granular B and SSM 100% passing 26.5 mm | 25 |
| 50 mm Crushed Aggregate | 50 |

Note: Each sample container shall hold no more than 25 kg of material.



**MATERIAL SPECIFICATION FOR
AGGREGATES - BASE, SUBBASE,
SELECT SUBGRADE, AND BACKFILL MATERIAL**

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| 1010.01 | SCOPE |
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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 μ m Sieve in Mineral Aggregates by Washing |
| LS-602 | Sieve Analysis of Aggregates |
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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

| MTO Laboratory Test and Number | Granular O | Granular A | Granular S | Granular B Type I and Type III | Granular B Type II | Granular M | Select Subgrade Material |
|---|-------------|------------|------------|--------------------------------|--------------------|------------|--------------------------|
| 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 1.0×10^{-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

| Material | Minimum Mass of Individual Field Samples kg |
|--|--|
| Granular A, S, M, and O | 25 |
| Granular B and SSM | 50 |
| Granular B and SSM (100% passing 26.5 mm sieve) | 25 |
| <p>Note:</p> <p>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.</p> | |

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

| Quantity from Each Source or Process t | Granular A; Granular B - Type I, II, and III; Granular M; Granular O; and Select Subgrade Material |
|--|---|
| ≤ 5,000 | One sample. |
| > 5,000 (Note 1) | One sample per 5,000 tonnes. |
| Note: 1. When the 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. | |

Appendix 1010-B

Table B-2 is added.

TABLE B-2
Sampling and Testing Frequency for Gradation Requirements

| Quantity from Each Source or Process t | Granular A, O, and M | Granular B - Type I, II, and III, and Select Subgrade Material |
|---|---|--|
| < 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> <p>a) Less than one-half the quantity required for a sample, then that quantity shall be added to the quantity representing the previous sample.</p> <p>b) Greater than or equal to one-half the quantity required for a sample, then that quantity shall require its own sample.</p> | | |

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 x 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

Appendix 1010-E, 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
GRADATION REQUIREMENTS, LS-602**

| | | | |
|-----------------------------|-------------|------------------------------------|-------------------------|
| 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) : | |

| Sieve Size | Gradation Requirement, % Passing | | | | | | | | Test Result | |
|------------|----------------------------------|---------------------------|---------|---------------------------|-------------------------------|--------|--------------------------------|--------|-------------|--------------------------|
| | A | B (Note 1) | | | M | O | S | SSM | Sample | Meets Requirements (Y/N) |
| | | Type I (Note 2) | Type II | Type III (Note 2) | | | | | | |
| 150 mm | -- | 100 | -- | 100 | -- | -- | -- | 100 | | |
| 106 mm | -- | -- | 100 | -- | -- | -- | -- | -- | | |
| 37.5 mm | -- | -- | -- | -- | -- | 100 | -- | -- | | |
| 26.5 mm | 100 | 50-100 | 50-100 | 50-100 | -- | 95-100 | 100 | 50-100 | | |
| 19.0 mm | 85-100 (87-100, Note 3) | -- | -- | -- | 100 | 80-95 | 90-100 | -- | | |
| 13.2 mm | 65-90 (75-95, Note 3) | -- | -- | -- | 75-95 | 60-80 | 75-100 | -- | | |
| 905 mm | 50-73 (60-73, Note 3) | -- | -- | 32-100 | 55-80 | 50-70 | 60-85 | -- | | |
| 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 | 2-55 | 2-65 | 5-22 | 2-35 | 5-22 | -- | 11-25 | 5-95 | | |
| 150 µm | -- | -- | -- | -- | -- | -- | -- | 2-65 | | |
| 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:

- When Granular B is used for granular backfill for pipe subdrains, 100% of the material shall pass the 37.5 mm sieve.
- When RAP is blended with Granular B Type I or Type III, 100 percent of the RAP shall pass the 75 mm sieve. Conditions in Note 1 supersede in this requirement.
- When the aggregate is obtained from an iron blast furnace slag source.
- When the aggregate is obtained from a quarry or blast furnace slag or nickel slag source.

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