MATERIAL SPECIFICATION FOR AGGREGATES - SURFACE TREATMENT

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1006.01 SCOPE

This specification covers the requirements for aggregates for use in surface treatment.

1006.02 REFERENCES

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

Ontario Provincial Standard Specifications, Materials

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-604 Relative Density and Absorption of Coarse Aggregate
LS-606 Soundness of Aggregate by Use of Magnesium Sulphate
LS-607 Percent Crushed Particles in Processed Coarse Aggregate
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LS-609 Petrographic Analysis of Coarse Aggregate
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LS-614 Freezing and Thawing of Coarse Aggregate

LS-618 The 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 Granular Materials
LS-631 Qualitative Determination of Presence of Plastic Fines in Aggregates

MTO Forms:
PH-CC-110 Surface Treatment Aggregates - Gradation, Computation, Acceptance & Payment Adjustment Sheets
PH-D-10 Aggregate Sample Data Sheet

1006.03 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.

Lot means a specific quantity of material from a single source.

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. Aggregate production processes generally do not affect physical properties.

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.

Slag means for the purposes of this specification, fused silicate material from the processing of ores and includes air-cooled blast furnace slag, blast furnace slag, copper slag, nickel slag, and steel slag.

1006.05 MATERIALS

1006.05.01 Aggregates

Aggregates shall be according to OPSS 1001, unless otherwise specified in this specification.

Aggregates shall be clean, hard durable particles produced from sands, gravels, or quarried rock and shall be free of earth, humus, clay coatings, and clay lumps or fragments of any size or shape.

Aggregates containing slag or composed of slag shall not be acceptable for use as surface treatment aggregates.

At the discretion of the Owner, aggregate may be accepted or rejected for physical properties on the basis of past field performance, according to Note 1 shown in Table 1.

When any change in the character of the aggregate occurs or when the performance of aggregate meeting the requirements of this specification is found to be unsatisfactory, use of that aggregate shall be discontinued until a reappraisal by the Contractor, with the approval of the Contract Administrator, proves the source to be satisfactory.

1006.07 PRODUCTION

1006.07.01 Aggregate Processing, Handling, and Stockpiling

Aggregates separated during processing, aggregates secured from different sources, and aggregates from the same source but of different gradations shall be stockpiled separately. When screenings from primary and secondary crushers are produced separately, they shall be stockpiled separately.

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 removed from the stockpile immediately.

1006.08 QUALITY ASSURANCE

1006.08.01 General

The laboratory designated by the Owner shall carry out QA testing for purposes of ensuring that the 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 specified in the Contract Documents. Individual test results shall be forwarded to the Contractor, as they become available.

When a hydrated lime anti-stripping agent is used, test samples for the physical property requirements shall be taken prior to the addition of the hydrated lime. If this is not practical, samples coated in hydrated lime may be taken and the lime removed by washing prior to testing. In this case, the requirements for LS-601 shall be waived.

QA acceptance of aggregates for surface treatment shall be based on lots that are sampled and tested for both physical properties and gradation.

1006.08.02 Alternative to LS-614

LS-614 shall be used for acceptance, unless written notification to the Contract Administrator to replace it with LS-606 for acceptance is received prior to sampling of the applicable materials for QA purposes. Provided the Contract Administrator has received such a request, LS-606 shall be used. Otherwise, conformance to LS-614 shall be required.

When notification is provided after QA testing using LS-614 has been initiated, the Contractor shall then be charged $600.00 for each test initiated, which includes the cost of the testing using LS-614, administrative charges, and additional sampling, if required.

1006.08.03 Sampling

Aggregates to be used in the Work shall be made available for sampling a minimum of 3 weeks prior to the time of intended use. The Contract Administrator shall have access to all sampling locations at any time with notice to the Contractor. The stockpiles from which the samples are to be taken shall contain at least 10% of the total quantity of aggregate needed or a minimum quantity of 500 tonnes or 250 m3, whichever is greater, unless otherwise directed by the Contract Administrator.

All samples shall be duplicate samples obtained from stockpiles according to LS-625 and all other requirements stated elsewhere in the Contract Documents.

For physical properties, at least one set of QA samples of each aggregate and from each individual source shall be randomly sampled from lots according to the schedule shown in Table 1.

For production properties, lots according to the schedule shown in Table 1 shall be divided into four sublots of approximately equal tonnage. One duplicate QA sample shall be randomly obtained from each sublot.

Duplicate QA samples with a minimum mass of 25 kg shall be taken from the stockpiles. Each bag or container shall hold no more than 30 kg of material.

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. The Contract Administrator shall seal each QA sample container at the time and place of sampling.

QA samples shall be identified both inside and outside of the sample container. Data to be included with QA samples shall be according to MTO form PH-D-10.

In the event that the Contractor is unavailable to take the samples, no further materials shall be placed in the Work until they have been taken.

One of the duplicate QA samples shall be randomly selected for testing by the QA laboratory. The QA laboratory shall retain the remaining sample for referee testing, if required.

1006.08.04 Acceptance

The acceptability of a lot of aggregates for surface treatment may result in payment at full price, payment at a reduced price, or rejection.

Irrespective of the negotiation of a reduced price payment, the warranty provisions of the Contract Documents shall apply.

1006.08.04.01 Acceptance of Physical Properties

A lot of aggregates shall be deemed to be acceptable for physical properties if all of the test results for the samples representing that lot meet all of the requirements shown in Table 2.

If a tested sample of aggregates representing a lot does not meet all of the requirements of this specification, then a reduced price payment of 20% shall be given for that lot, as long as the applicable test results for that sample do not:

a) Exceed the requirement for LS-614, or LS-606 if it has been accepted by the Owner as an alternative to LS-614, by more than 25% of the specified value.

b) Exceed the requirement for LS-618 by more than 10% of the specified value.

c) Exceed the requirement for LS-619 by more than 15% of the specified value.

d) Identify plastic fines within the material, when determined according to LS-631 and meet the requirements for LS-602 on the 75 µm sieve.

e) Exceed 10% of the specified value for any other requirement stated in this specification.

Should the test results for the sample not meet all of the requirements listed above, then all of the aggregates within that lot shall be considered rejectable and any surface treatment that includes those aggregates shall be removed from the Work at no cost to the Owner.

1006.08.04.02 Acceptance of Production Properties Based on LS-602 and LS-607

Test results from each sublot within a lot shall be combined to determine the mean and the range of the lot for each test.

All lot means and ranges for test results carried out according to LS-602 and LS-607 shall be computed to one decimal place and reported on the MTO Form PH-CC-110 by the Contract Administrator.

The acceptability of a lot based on LS-602 and LS-607 may result in payment at full price, payment at a reduced price or rejection.

A complete or incomplete lot shall be deemed to meet the applicable requirements for LS-602 and LS-607, if the mean of the test results for that lot is within the limits specified in Table 3 and the range of the test results for that lot is within the limits specified in Table 5.

Lots that are subject to a total payment adjustment factor of more than 25 percent in respect of lot mean and range are deemed to be rejected and shall be removed from the Work at no cost to the Owner.

When the Contractor chooses to use a lot or incomplete lot that does not meet the requirements of LS-602 and LS-607 and is not subject to removal then, at the request of the Contractor, a payment adjustment calculated according to the following formula shall be allowed:

PAYMENT REDUCTION = lot quantity in tonnes (or m^3) × item price in \$/tonne (or \$/m^3) × payment adjustment factor (%),

Where:

The lot quantity shall be expressed in tonnes (or m^3) and the item price shall be the contract price for the tender quantity in tonnes (or m^3).

The payment adjustment factor, in percent for production properties, shall be equal to the sum of the adjustment points determined as follows:

a) adjustment points shall be applied for each 0.1 percent that the mean gradation falls outside the gradation specification limits for each sieve, according to Table 4,

b) 0.1 adjustment points shall be applied for each 0.1 percent that the range exceeds the maximum acceptable range for each sieve, according to Table 5; and

c) 0.2 adjustment points shall be applied for each 0.1 percent that the lot mean falls below the applicable limits for percent crushed.

The reduced price payment for the lot given above shall be in addition to any payment reduction determined according to the Acceptance of Physical Properties clause.

1006.08.05 Referee Testing

The Contractor may invoke referee testing for one or more attributes by submitting a written request to the Contract Administrator within 5 Business Days following notification that the aggregate does not meet the requirements of this specification.

Referee testing shall be carried out as specified herein and elsewhere in the Contract Documents.

The retained QA samples shall be used for referee testing.

All referee test results for a lot shall replace the respective QA tests for acceptance of the applicable lot and shall be binding on both the Owner and the Contractor.

If a lot is not accepted at full payment based on the referee test results, the Contractor shall then be responsible for the cost of referee testing of that lot, including the cost of transporting the samples to the referee laboratory at the rates specified elsewhere in the Contract Documents. In all other cases, the Owner shall bear the cost of the referee testing and the cost of transporting the samples of that lot.

TABLE 1
Lot Schedule for Sampling and Testing

Quantity from Each Source In tonnes (or m^3)	**Class 1, 2, 3, 4, 5, and 6**
< 500 t (or < 250 m^3)	Sampling and testing may be waived at the discretion of the Owner.
500 t to 5,000 t (or 250 to 2,500 m^3)	One lot for both physical properties and gradation.
> 5,000 t (or > 2,500 m^3) (Note 1)	Gradation: 5,000 tonne lots up to 20,000 tonnes and 10,000 tonne lots thereafter (or 2,500 m^3 lots up to 10,000 m^3 and 5,000 m^3 lots thereafter) Physical Properties: 20,000 tonne lots (or 10,000 m^3 lots)

Notes:

1. When the quantity of granular material is insufficient for a complete lot and is:
   a) less than one-half the quantity of a complete lot, that quantity shall then be added to the previous lot; or
   b) greater than or equal to one-half the quantity of a complete lot, then that quantity shall form its own lot.

TABLE 2
Physical Property Requirements

MTO Laboratory Test	MTO Test No.	Class 1 (Note 1)	Class 2 (Note 1)	Class 3 (Note 1)	Class 4	Class 5 (Note 1)	Class 6 (Note 1)
Wash Pass 75 μm sieve, Guideline B, % maximum	LS-601	1.3 (Note 2)	--	1.3 (Note 2)	--	1.3 (Note 2)	1.3 (Note 2)
Absorption, % maximum	LS-604	1.75	--	2.0	--	1.75	1.75
Flat and Elongated Particles, % maximum	LS-608	20	20	20	--	20	20
Petrographic Examination, % non-carbonate of retained 4.75 mm, minimum	LS-609	60 (Note 3)	60 (Note 3)	60 (Note 3)	--	60 (Note 3)	60 (Note 3)
Unconfined Freeze-Thaw, % maximum loss (Note 4)	LS-614	6	15	6	--	6	6
Micro-Deval Abrasion (Coarse Aggregate), % maximum loss	LS-618	17	25	17	--	17	17
Micro-Deval Abrasion (Fine Aggregate), % maximum loss	LS-619	--	30	--	25	--	--
Plastic Fines	LS-631	--	NP	--	NP	--	--
Alternative Requirement to Unconfined Freeze-Thaw Loss, LS-614							
Magnesium Sulphate Soundness (coarse aggregate), % max loss	LS-606	12	15	12	--	12	12

Notes:

1. With the exception of LS-619 and LS-631, the physical property requirements for Class 1, 2, 3, 5, and 6 aggregates noted above shall be conducted on the material retained on the 4.75 mm sieve.
2. When quarried rock is used as a source of coarse aggregate, a maximum of 2.0% passing the 75 μm sieve shall be permitted.
3. The requirements listed below are only applicable to the area to the north and west of a boundary defined by the north shore of Lake Superior, the north shore of the St. Mary's River, the south shore of St. Joseph's Island, the north shore of Lake Huron easterly to the north and east shore of Georgian Bay, excluding Manitoulin Island, along the Severn River to Washago and a line easterly passing through Norland, Burnt River, Burleigh Falls, Madoc, and hence easterly along Highway 7 to Perth and northerly to Calabogie and easterly to Arnprior and the Ottawa River:
   a) When the coarse aggregate for use in surface treatment is obtained from a gravel pit or quarry containing more than 40% carbonate rock type (e.g., limestone and dolostone) then blending with aggregate from non-carbonate rock types shall be required to increase the minimum non-carbonate rock type content of the coarse aggregate to 60%, as determined by petrographic examination, LS-609. In cases of dispute, LS-613 shall be used with a minimum acid insoluable residue of 60%.
   b) When the coarse aggregate for use in surface treatment is obtained from a non-carbonate source, blending with aggregate from carbonate rock types is not permitted.
4. The Owner shall waive the requirements for LS-614, unconfined freeze-thaw, provided the Contractor has submitted a written request that the coarse aggregates meet the alternative requirements for LS-606, magnesium sulphate soundness.

TABLE 3
Production Requirements

Lab Test Description	MTO Test Number	Class 1 (Note 1)	Class 2	Class 3	Class 4	Class 5 (Note 1)	Class 6
Sieve Analysis	**LS-602**	**% Passing By Mass**					
	Sieve Size						
	19.0 mm	--	100	100	--	--	--
	16.0 mm	--	98-100	96-100	--	--	100
	13.2 mm	100	75-95	67-86	--	--	96-100
	9.5 mm	75-100	50-80	29-52	100	100	50-73
	6.7 mm	0-40	--	--	--	40-85	--
	4.75 mm	0-10	25-50	0-10	70-100	5-25	0-10
	2.36 mm	--	--	--	10-100	0-10	--
	1.18 mm	--	10-40	--	5-90	0-5	--
	600 μm	--	--	--	3-70	--	--
	300 μm	--	2-20	--	2-40	--	--
	150 μm	--	2-13	--	0-15	--	--
	75 μm	(Note 2)	2-7	(Note 2)	0-7	(Note 2)	(Note 2)
Percent Crushed Particles	**LS-607**	**% Minimum**					
		60	60	60	-	60	60

Notes:

1. Class 1 and Class 5 aggregates shall be washed according to OPSS 1001.
2. The requirements for percent passing the 75 μm for Class 1, 3, 5, and 6 aggregates are shown in Table 2.

TABLE 4
Mean Requirements For Gradation (LS-602)

MTO Sieve Designation	Adjustment Points Per 0.1% Deviation from Specified Limit					
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
19.0 mm	--	0.1	0.1	--	--	--
16.0 mm	--	0.1	0.1	--	--	0.1
13.2 mm	0.1	0.1	0.1	--	--	0.1
9.5 mm	0.1	0.1	0.1	0.1	0.1	0.1
6.7 mm	0.1	--	--	--	0.1	--
4.75 mm	Excess Passing 0.5 / Insufficient Passing 0.2					
2.36 mm	--	--	--	--	0.1	--
1.18 mm	--	0.1	--	--	0.1	--
600 μm	--	--	--	0.1	--	--
300 μm	--	0.1	--	0.1	--	--
150 μm	--	0.1	--	0.1	--	--
75 μm	--	1.0	--	1.0	--	--

TABLE 5
Range Requirements for Gradation (LS-602)

MTO Sieve Designation	Maximum Acceptable Range					
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6
19.0 mm	--	1	1	--	--	--
16.0 mm	--	2	4	--	--	1
13.2 mm	1	12	14	--	--	4
9.5 mm	20	14	16	1	1	14
6.7 mm	24	--	--	--	24	--
4.75 mm	8	14	5	18	14	6
2.36 mm	--	--	--	34	8	--
1.18 mm	--	14	--	34	4	--
600 μm	--	--	--	--	--	--
300 μm	--	12	--	22	--	--
150 μm	--	8	--	12	--	--
75 μm	--	4	--	6	--	--