MATERIAL SPECIFICATION FOR AGGREGATES – WATERBODY

TABLE OF CONTENTS

1005.01 SCOPE

This specification covers the requirements for aggregate materials placed in waterbodies.

1005.01.01 Specification Significance and Use

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

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

1005.01.02 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.

1005.02 REFERENCES

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

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

Ontario Provincial Standard Specifications, Materials

OPSS 1001 Aggregates - General

Ontario Ministry of Transportation Publications

MTO Laboratory Testing Manual:
LS-602 Sieve Analysis of Aggregates
LS-604 Relative Density and Absorption of Coarse Aggregate
LS-618 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-619 Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus
LS-625 Guidelines for Sampling of Aggregate Materials
LS-630 Determination of the Amount of Contamination of Coarse Aggregate

MTO Forms:
PH-CC-112 Waterbody Materials Worksheet
PH-D-10 Aggregate Sample Data Sheet

ASTM International

D6473-15 Standard Test Method for Specific Gravity and Absorption of Rock for Erosion Control

1005.03 DEFINITIONS

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

Deleterious Material means as defined in OPSS 1001.

Waterbody means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses.

Watercourse means a stream, creek, river, or channel including ditches, in which the flow of water is permanent, intermittent, or ephemeral.

1005.05 MATERIALS

1005.05.01 General

The requirements of OPSS 1001 shall apply to this specification.

All waterbody materials shall consist of clean, hard, durable, natural particles that are free of earth, humus, clay or other coatings, clay lumps, shale or shaley partings, deleterious materials, or deleterious substances. Crushed rock, reclaimed asphalt pavement, reclaimed hydraulic cement concrete, glass, ceramics, or any other reclaimed or slag materials shall not be used.

Waterbody materials for the WB-100 and smaller gradation bands, shall consist of naturally-formed, rounded or sub-rounded materials obtained from pit sources. Waterbody materials with top sizes larger than the gradation band for WB-100 may come from pit sources, quarry sources or both, unless otherwise specified in the Contract Documents.

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

All waterbody materials shall be according to Table 1 for physical properties and according to Tables 2, 3, and 4, for gradation or size & mass requirements for larger boulders or pieces of rock.

1005.07 PRODUCTION

1005.07.01 Aggregate Processing, Handling, and Stockpiling

Aggregates separated during processing shall be placed in individual stockpiles. Processed aggregates secured from different sources and aggregates from the same source, but of different gradations shall be placed in individual stockpiles.

Aggregates that have become mixed with foreign matter of any description or aggregates from different stockpiles that have become mixed with each other shall not be used and shall be removed from the stockpile immediately.

1005.08 QUALITY ASSURANCE

1005.08.01 General

The total quantity of each different waterbody material type from each source location shall represent an individual lot.

Each lot shall be randomly sampled, as specified in the Contract Documents.

The Contract Administrator shall be allowed access to all sampling locations.

The laboratory designated by the Owner shall carry out QA testing for the purpose of ensuring that the aggregates used in the Work are according to the physical property and gradation requirements of this specification. The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise indicated in this specification. Individual test results shall be forwarded to the Contractor, as they become available.

Test data for each aggregate type shall be managed independently. When more than one source is used for supplying material, test data from each source and product shall be managed independently.

1005.08.02 Sampling

Sampling shall be according to LS-625 and taken at the time and location determined by the Contract Administrator. Samples shall be of sufficient mass to conduct the necessary gradation and physical property tests of the material. Minimum sample sizes for each aggregate type, up to the WB-350 gradation, shall be as shown in Table 5.

Unless otherwise specified, all QA samples shall be taken from individual stockpiles constructed at the Working Area or at the source. Each QA sample shall be treated as a discrete sample and not combined or blended with any other sample.

All samples, representing one lot of aggregate, shall be duplicate samples.

The Contractor shall provide new or clean sample bags or containers that are constructed to prevent the loss of any part of the material or contamination or damage to the contents during shipment. Metal or cardboard containers are unacceptable. QA samples shall be identified both inside and outside of the sample container. Data shall be included with QA samples shall be according to the requirements of MTO Form PH-D-10.

At least one set of QA samples shall be obtained for each aggregate type used in the Work. The Contract Administrator shall seal each QA sample container at the time and place of sampling.

Medium to large boulders, as specified in Table 4, shall be randomly chosen for sampling, at the discretion of and at the location determined by the Contract Administrator.

Duplicate sawed portions of individual boulders for specific gravity and absorption testing of WB-350 and larger waterbody materials, as specified in Note 1 of Table 1, shall be obtained from the Working Area.

1005.08.03 Testing and Retention of Samples

When the Contract Administrator has elected to carry out QA testing, one of the duplicate samples shall be randomly selected for testing by the QA laboratory. The QA laboratory shall retain the remaining sealed sample for possible referee testing, if required.

1005.08.04 Acceptance

QA test results shall be used for acceptance purposes, except when referee testing has been carried out.

When QA test results for the sample representing an individual lot shows that the material meets the applicable gradation and physical property requirements of this specification, the lot shall be accepted.

When QA test results show that the material does not meet the applicable requirements of this specification, then all the aggregates in that lot shall be considered rejected and shall be removed from the Work at no additional cost to the Owner.

The Contract Administrator shall notify the Contractor that material represented by the test result is not acceptable. This notification shall take place in writing within 3 Business Days of receipt of the non-conforming data.

1005.08.05 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 duplicate QA sample 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 based on the referee test results, then the Contractor shall be responsible for the cost of the 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
Physical Property Requirements for Waterbody Materials

Description of Test	Test Number	WB-6.7	WB-13.2	WB-19	WB-37.5	WB-53	WB-100	WB-200	WB-350	WB-400	WB-500	WB-750	WB-1000	WB-1250	WB-1500
Specific Gravity, Minimum	ASTM D 6473 (Note 1)	-	-	-	-	-	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Absorption, % Maximum		-	-	-	-	-	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Loss by Washing, Pass 75 µm Sieve, Guideline A, % Maximum	LS-602	5.0	2.0	2.0	-	2.0	-	-	-	-	-	-	-	-	-
Absorption, % Maximum	LS-604	2.0	2.0	2.0	2.0	2.0	-	-	-	-	-	-	-	-	-
Micro-Deval Abrasion Coarse Aggregate Loss, Grading A % Maximum	LS-618	-	30	30	30 (Note 2)	30	30 (Note 3)	-	-	-	-	-	-	-	-
Micro-Deval Abrasion Fine Aggregate Loss, % Maximum	LS-619	35	-	-	35	-	-	-	-	-	-	-	-	-	-
Amount of Contamination, % Maximum	LS-630	0.5	0.5	0.5	0.5	0.5	(Note 4)	(Note 4)	(Note 4)	(Note 4)	(Note 4)	(Note 4)	(Note 4)	(Note 4)	(Note 4)

Notes:

1. These requirements shall be based on the average test results for at least five cobbles or boulders, where the source appears lithologically uniform or at least eight cobbles or boulders, where the source appears lithologically non-uniform. The cobbles or boulders, to be tested, shall be randomly sampled, as specified in Notes 1, 2, 3, and 4 of Table 5. In addition, no individual piece of tested rock shall have a specific gravity less than 2.30 or an absorption greater than 3.5%.
2. This requirement shall be waived if the material has more than 80% passing the 4.75 mm sieve.
3. Testing may be carried out on another aggregate product, if it is being simultaneously produced from the same formation and location within a pit or a quarry and during the same production stage, as the WB-100, as long as the quantity of the other aggregate product being produced is sufficient for sampling and testing using LS-618. For example, if it can be demonstrated that the cobbles used to produce WB-100 are the oversize for the simultaneous production of a coarse granular material which has a Micro-Deval Abrasion Loss of no more than 30%, according to LS-618, then the WB-100 cobbles being simultaneously produced with that granular material shall also be considered to meet the requirements of LS-618.
4. Stockpiles of these waterbody materials shall not contain any visible contamination.

TABLE 2
Gradation Requirements for Sand and Gravel Used for Waterbody Materials, Percent Passing

Sieve Size mm	Gradation (LS-602) of Waterbody Materials % Less Than Sieve Size Specified				
	WB-6.7	**WB-13.2**	**WB-19**	**WB-37.5**	**WB-53**
63.00	-	-	-	-	100
53.00	-	-	-	100	90-100
37.50	-	-	-	90-100	-
26.50	-	-	100	50-100	-
19.00	-	-	90-100	-	0-15
16.00	-	100	-	-	-
13.20	-	96-100	-	-	-
9.50	100	50-73	0-55	30-100	-
6.70	97-100	-	-	-	-
4.75	90-100	0-10	0-10	20-100	-
2.36	50-95	-	-	-	-
1.18	20-90	-	-	10-100	-
0.60	0-70	-	-	-	-
0.30	0-35	-	-	2 - 65	-
0.15	0-15	-	-	-	-
0.07	0-5	0-2	0-2	0-8	0-2

TABLE 3
Mass Gradation Requirements for Cobbles and Small Boulders Used as Waterbody Materials

Gradation %, By Mass, Less Than Mass Specified (Note 1)				
Maximum 2nd Smallest Dimension of an Equivalent Rectangular Prism (mm)	**Mass of Gravel/Cobble /Boulder (kg)**	**Waterbody Material Designation**		
		WB-100	**WB-200**	**WB-350**
350	97 (Note 2)	-	-	100
300	60 (Note 2)	-	-	75-100
200	18	-	100	20-40
150	7.7	-	40-60	0-15
100	2.3	100	0-10	-
63	0.55	40-60	-	-
53	0.35	0-10	-	-

Note:

1. The mass gradation shall be determined by individually weighing a minimum of 20 randomly-chosen cobbles and small boulders from a sampling pad, constructed according to LS-625, from the stockpiled material that's intended for use and then comparing the mass of the stone particles within each specified fraction of the mass gradation with the total mass of all of the stone particles that were measured for that sample. That information shall be recorded on Form PH-CC-112.
2. For a boulder with a mass larger than 25 kg, its approximate mass may be determined by multiplying the average of its three rectilinear dimensions (i.e. for an equivalent rectangular prism) by the average specific gravity for the same waterbody material, determined in accordance with Note 1 of Table 1.

TABLE 4
Medium to Large Boulders Used For Waterbody Materials

Size	Waterbody Material Designation					
	WB-400	**WB-500**	**WB-750**	**WB-1000**	**WB-1250**	**WB-1500**
Designated Size (i.e. the Average of the Two Smallest Dimensions of an Equivalent Rectangular Prism) (mm)	(Note 1)					
	400	500	750	1000	1250	1500
Average Approximate Mass of Boulders (kg) (Note 2)	145	285	955	2265	4425	7645

Note:

1. For each waterbody material designation, the dimensions for a minimum of 20 randomly-chosen boulders, that are intended for use, shall be recorded on Form PH-CC-112. Within that sample:
   a) the largest rectilinear dimension of every boulder shall be no more than 1.5 times the average of its 2 smallest rectilinear dimensions (i.e. for an equivalent rectangular prism); and
   b) At least 80% of the boulders, by mass, shall have an average of their two smallest rectilinear dimensions (i.e. for an equivalent rectangular prism), no larger than the Designated Size and no smaller than 60% of the Designated Size.
2. Note that the mass of any individual boulder, will vary significantly from the stated values, depending on its shape (e.g. cubical, prism, sphere, oblate spheroid etc.) and actual dimensions.

TABLE 5
Sample Size Requirements

Waterbody Material Designation	Minimum Sample Size for Physical Properties Testing kg (Note 1)
WB-6.7	10
WB-13.2	20
WB-19	20
WB-37.5	40
WB-53	80
WB-100	25 (Note 2)
WB-200	75 (Note 3)
WB-350	150 (Note 3)
WB-400, WB-500, WB-750, WB-1000, WB-1250 and WB-1500	(Note 4)

Notes:

1. Duplicate samples shall be randomly taken from sampling pads constructed from each stockpiled material that's intended for use and individual sample bags shall not exceed 25 kg.
2. Each duplicate sample shall consist of at least five cobbles from lithologically uniform sources or at least eight cobbles from lithologically non-uniform sources and no cobble shall have a mass less than 0.4 kg.
3. Each duplicate sample shall consist of at least five cobbles or boulders from lithologically uniform sources or at least eight cobbles or boulders from lithologically non-uniform sources and no boulder shall have a mass greater than 25 kg
4. Where duplicate portions of medium to large boulders are required for specific gravity and absorption testing, as specified in Note 1 of Table 1, such boulders shall be randomly chosen, at the locations determined by the Contract Administrator and the duplicate sample portions that are required for testing, shall be cut from the boulders, using a portable diamond saw at the contract site.

Appendix 1005-A, November 2021
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS

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

Designer Action/Considerations

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

Related Ontario Provincial Standard Drawings

No information provided here.