



**MATERIAL SPECIFICATION FOR  
AGGREGATES - HOT MIX ASPHALT**

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**1003.01 SCOPE**

This specification covers material requirements for aggregates for use in hot mix asphalt (HMA).

**1003.02 REFERENCES**

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

**Ontario Provincial Standard Specifications, Construction**

OPSS 313 Hot Mix Asphalt - End Result

**Ontario Provincial Standard Specifications, Materials**

OPSS 1001 Aggregates - General

**Ontario Ministry of Transportation Publications**

MTO Laboratory Testing Manual:

LS-282 Quantitative Extraction of Asphalt Cement and Analysis of Extracted Aggregate From Bituminous Paving Mixtures

- LS-312 Fractionation of Unextracted Reclaimed Asphalt Pavement (RAP) and Hot Mix Aggregates for Testing or Incorporation in Other Test Samples.
- LS-600 Dry Preparation of Aggregates For the Determination of Physical Constants
- LS-601 Material Finer than 75µm Sieve in Mineral Aggregates by Washing
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- LS-625 Guidelines for Sampling of Granular Materials
- LS-629 Uncompacted Void Content of Fine Aggregate
- LS-631 Qualitative Determination of Presence of Plastic Fines in Aggregates

Designated Sources for Materials (DSM)

DSM #3.05.25 Aggregates: Surface Friction Courses

#### **ASTM International**

- D 4791-10 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
- D 5821-01(2006) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

#### **American Association of State Highway and Transportation Officials (AASHTO)**

- T176-08 Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test

### **1003.03 DEFINITIONS**

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

**Aggregate** means as defined in OPSS 1001.

**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.

**Bench** means a relatively horizontal ledge or platform in a quarry that forms a single level of operation above which rock is excavated from a contiguous face.

**Chip Product** means an aggregate co-product from the crushing operation with 100% passing the 9.5 mm sieve, predominantly passing the 4.75 mm sieve and retained on the 2.36 mm sieve.

**Coarse Aggregate** means that portion of aggregate material retained on the 4.75 mm or larger sieve when tested according to LS-602.

**Consensus Property** means an aggregate property required for use in a Superpave mix.

**Copper Slag** means the non-metallic product resulting from the production of copper.

**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.

**Fine Aggregate** means that portion of aggregate material passing the 4.75 mm sieve when tested according to LS-602.

**Hot Mix Asphalt (HMA)** means as defined in OPSS 313.

**Nickel Slag** means the non-metallic product resulting from the production of nickel.

**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.

**Primary Coarse Aggregate** means the aggregate component that represents the greatest proportion of the coarse aggregate in the mix design. For Superpave 12.5 FC1, Superpave 12.5 FC2 and SMA mixes, the Primary Coarse Aggregate may be identified as Type (D), (G), (M) or (T), as listed in DSM List #3.05.25.

**Quality Assurance (QA)** means as defined in OPSS 313

**Reclaimed Asphalt Pavement (RAP)** means as defined in OPSS 313.

**Roof Shingle Tabs (RST)** means as defined in OPSS 313.

**Steel Slag** means the non-metallic product resulting from the production of steel in a basic oxygen furnace or an electric arc furnace.

**Stone Mastic Asphalt (SMA)** means as defined in OPSS 313.

**Superpave (Superpave™)** means as defined in OPSS 313.

## **1003.05 MATERIALS**

### **1003.05.01 General**

Aggregates shall be according to OPSS 1001 and shall meet all of the requirements of this specification when tested using the applicable MTO, AASHTO, and ASTM test methods identified herein.

Except as noted below or elsewhere in the Contract Documents, aggregates may be sands, gravels, quarried rock, the aggregate portion of RST, or the aggregate portion of RAP, provided that the source or sources are of such nature and extent to ensure acceptable processed aggregates of a consistent gradation and quality. 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 the aggregate shall be discontinued until a reappraisal by the Contractor, with the approval of the Contract Administrator, proves the source to be satisfactory.

Steel slag, air-cooled blast furnace slag, nickel slag and copper slag shall not be used in HMA. RAP containing steel slag aggregate, RST containing asbestos, and post-consumer shingle material shall not be permitted.

RAP used in an HMA surface or binder course mix shall be comprised of aggregates that, when combined with all of the other aggregates in the mix, will meet the Owner's physical property requirements specified in Table 4.

The need for, type of and application of anti-stripping additive shall be as specified in the Contract Documents.

For Superpave 12.5FC 1, the coarse aggregates in the mix shall be produced from crushed bedrock material or gravel supplied from sources named on the DSM #3.05.25.

For Superpave 12.5FC 2, both the coarse and fine aggregates in the mix shall be produced from crushed bedrock material supplied from sources named on DSM #3.05.25. Coarse aggregate for Superpave 12.5FC 2 may be obtained from a different source than the fine aggregate. When RAP is used in Superpave 12.5FC 2, the coarse aggregate portion of the RAP may be derived from different sources. In all other cases, blending of coarse aggregates for Superpave 12.5FC 2 from different sources shall not be permitted. Blending of fine aggregates for Superpave 12.5FC 2 from different sources is permitted provided that aggregate fraction retained on the 4.75 mm sieve as part of the blended fine aggregate comprise less than 20% by mass of the total amount of coarse aggregate.

For SMA surface courses, both the coarse and fine aggregates shall be produced from crushed bedrock supplied from sources shown in DSM #3.05.25. Both the coarse and fine aggregates shall be obtained from the same source except where aggregate is derived from RST.

Chip products shall be derived:

- a) For Superpave 12.5FC 2, SMA 12.5 or SMA 9.5, from the same source as the primary coarse aggregate used in the mix; or
- b) For Superpave 12.5FC 1, from an aggregate source listed on DSM #3.05.25; or
- c) For all other mixes, either from an aggregate source listed on DSM #3.05.25 or from the same source and of the same lithology as a coarse aggregate that is being used the mix.

Filler shall consist of mineral filler, hydrated lime, Portland cement, or other material as specified and currently approved by the Owner for use in HMA. For SMA, the filler shall be mineral filler.

Mineral filler shall meet the following requirements:

- a) Be produced from quarried rock from the same bench that is also used to produce a screenings co-product that is shown to have a Micro-Deval of no more than 30%, when determined in accordance with LS-619, in lieu of the requirements shown in Note 2 of Table 1.
- b) Be sufficiently dry so that it flows freely.
- c) Be free from agglomerations.
- d) Be non-plastic according to LS-631.
- e) Be inert.
- f) Mineral filler shall also meet the following gradation requirements according to LS-602:
  - i) 100% passing the 600  $\mu\text{m}$  sieve.
  - ii) Not less than 70% passing the 75  $\mu\text{m}$  sieve.

In addition, the mineral filler for SMA mixes shall be of gradation and properties to be capable of producing asphalt mortar properties meeting the appropriate requirements as specified in the Contract Documents.

### **1003.05.02                    Gradation**

Each individual fine and coarse aggregate component shall be graded so that when combined with all other aggregates including RAP and/or RST, the overall gradation of the HMA specified in the Contract Documents is consistently being met.

### **1003.05.03                    Physical Property Requirements**

Each aggregate component of the mix shall be composed of clean, hard, durable particles.

With the exceptions of RAP and RST, the individual aggregate components of the mix shall be properly proportioned and blended, in accordance with the mix design.

The fraction of the combined aggregates passing the 4.75 mm sieve shall meet the physical property requirements specified in Table 1.

The fraction of the combined aggregates retained on the 4.75 mm sieve shall meet the physical property requirements specified in Table 2 for surface course mixes and Table 3 for binder or levelling course mixes, respectively.

In addition to the physical property requirements for the combined aggregate components described above, the combined fine and coarse aggregate fractions extracted from samples of HMA shall also meet the applicable physical property requirements specified in Table 4.

### **1003.05.04                    Consensus Property Requirements**

The fraction of the combined aggregates passing the 4.75 mm sieve, including aggregates derived from RAP or RST or both, each of which have been properly fractionated in accordance with LS-312 then proportioned and blended in accordance with the mix design, shall meet the consensus property requirements for AASHTO T 176 and LS-629 given in Table 5 for the traffic category specified in the Contract Documents. However, for AASHTO T 176 only, any fine aggregate that is derived from RAP or RST or both shall be excluded.

The fraction of the combined aggregates retained on the 4.75 mm sieve, including aggregates derived from RAP or RST or both, each of which have been properly proportioned and blended in accordance with the mix design, shall meet the consensus property requirements according to ASTM D4791 and ASTM D5821 given in Table 5, for the traffic category specified in the Contract Documents.

## **1003.07                        PRODUCTION**

### **1003.07.01                    Aggregate Processing, Handling, and Stockpiling**

Aggregates separated during processing, aggregates secured from different sources, and aggregates from the same source, but of different gradation, 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 material 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.

Aggregates shall be retained in stockpiles for at least 24 hours prior to use. Suitable stockpile locations are the site of mixing of the HMA, the aggregate source, or any other location acceptable to the Contract Administrator.

**1003.08                      QUALITY ASSURANCE**

**1003.08.01                  General**

A laboratory designated by the Owner shall carry out QA testing for purposes of ensuring that the aggregates used in the Work conform to the physical property, gradation and, at the discretion of the Contract Administrator, the consensus property requirements of this specification.

With the exceptions of RAP and RST and unless otherwise noted, QA testing will be conducted on combined samples prepared from individual QA samples by splitting off sufficient quantities of each individual aggregate component, based on percentages stated in the HMA mix design and the overall combined quantity required for testing.

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

The Owner shall be responsible for all costs associated with testing for QA purposes, unless otherwise indicated in this specification. Test results shall be forwarded to the Contractor, as they become available.

**1003.08.02                  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 that the Contract Administrator has received such a request, LS-606 shall be used. Otherwise, conformance to LS-614 shall be required.

When notification to replace LS-614 is received after QA testing using LS-614 has been initiated, the Contractor shall 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.

**1003.08.03                  Sampling**

Unless otherwise specified, all QA aggregate samples shall be taken at the hot mix plant from individual stockpiles, according to the Stockpile Method clause. Each QA sample shall be treated as discrete samples and not combined or blended with any other sample. In the absence of individual stockpiles at the plant, QA samples shall be taken at the aggregate source.

For physical properties, the following minimum number of random QA samples shall be obtained for every lot of 20,000 tonnes or part thereof of each HMA mix produced:

- a) One duplicate set of samples of all other primary coarse aggregates as well as all other aggregates used in the mix, including chip products;
- b) One sample of RAP, if RAP is used in the mix, for information purposes only;
- c) One sample of RST, if RST is used in the mix, for information purposes only;
- d) One duplicate sample of HMA during placement; and
- e) For Superpave 12.5FC 1, Superpave 12.5FC 2, SMA 9.5 and SMA 12.5 surface course mixes with a Type (D) primary coarse aggregate: two sets of duplicate samples of the primary coarse aggregate obtained from separate sampling pads constructed from aggregate obtained within the stockpile.

The aggregate samples described in part e) above, shall be taken during the same HMA production shift represented by the duplicate sample listed in d). If the Contract Administrator determines that this is not possible, then the samples described in part e) shall be taken within 24 hours or within no more than two HMA production shifts, represented by the duplicate sample listed in d), whichever is longer.

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

In addition to the duplicate samples taken for QA purposes, at the request of the Contract Administrator, a third sample shall be taken for Superpave 12.5FC 1, Superpave 12.5FC 2, SMA 9.5, and SMA 12.5 aggregates at the time the QA samples are taken.

During the production of each lot of SMA surface course mix, at the request of the Contract Administrator, random samples of both the mineral filler and the baghouse fines, shall also be taken. Each sample shall be placed in a triple-sealed metal container of suitable size, which shall be properly identified, and shall include the contract number, name of the Contractor, highway number, lot number, and the contact information of the person who conducted the sampling.

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

#### **1003.08.04.01            Sample Size**

The mass of the each QA sample shall meet the requirements shown in Table 6. When more than 30 kg of material is required, the total sample shall be recombined prior to testing.

#### **1003.08.04.02            Stockpile Method**

The stockpiles from which the QA samples are to be taken shall contain a minimum quantity of 500 tonnes of each aggregate, or at least 10% of the total quantity of aggregate needed for each HMA mix, unless otherwise directed by the Contract Administrator. QA sampling from stockpile shall be according to LS-625.

#### **1003.08.05                Acceptance**

The aggregates within a lot of HMA shall be deemed to be acceptable if all of the test results for the aggregates representing that lot meet all applicable requirements of this specification.

If QA test results of an aggregate sample representing a lot of HMA do not meet all of the requirements of this specification, then a reduced price payment of 10% of the tender price shall be given for each tonne of HMA left in the Work that includes any of the aggregates within that lot, as long as the applicable test results for that sample:

- a) Do not 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) Do not exceed the requirement for LS-618 by more than 10% of the specified value.
- c) Do not exceed the requirement for LS-619 by more than 15% of the specified value.
- d) Meet all other requirements of this specification.

If QA test results of an aggregate sample representing a lot of HMA do not meet the requirements listed above, then all of the aggregates within that lot shall be considered rejectable and any HMA that includes those aggregates shall be removed from the Work at no cost to the Owner.

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

**1003.08.06 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 an aggregate sample representing a lot of HMA 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 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, 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 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 Combined HMA Aggregates in**  
**Surface, Binder and Levelling Courses - Fraction Passing the 4.75 mm Sieve (Note 1)**

<b>MTO Laboratory Test Number</b>	<b>MTO Laboratory Test</b>	<b>SMA 9.5 &amp; 12.5; and Superpave 12.5FC 2</b>	<b>Superpave 12.5FC 1</b>	<b>SMA 19.0 and Superpave 4.75, 9.5, 12.5, 19.0, 25.0 &amp; 37.5</b>
LS-619	Micro-Deval Abrasion, % maximum loss	(Note 2)		
		15	20	25
LS-631	Plastic Fines	NP	NP	NP

Notes for Table 1:

- As specified in LS-600, the aggregate used for the following tests shall be prepared by first splitting off sufficient quantities of each of the aggregate components, based on their individual percentages stated in the mix design and the overall blended quantity required for the test(s). Then, with the exceptions of RAP and RST, the split portions of each of the other aggregate components shall be placed in a vessel of appropriate size and blended together by mixing. The blended aggregate shall then be split on the 4.75 mm sieve and the portion passing the 4.75 mm sieve set aside for testing.
- In addition to the requirements shown below, the Micro-Deval Abrasion loss for any individual aggregate component where the aggregate passing the 4.75 mm sieve represents more than 5% of the overall mix design gradation, by mass, shall not exceed 35%.

**Table 2**  
**Physical Property Requirements for Combined HMA Aggregates in Surface Courses**  
**- Fraction Retained on the 4.75 mm Sieve (Note 1)**

MTO Laboratory Test Number	Laboratory Test	Superpave 9.5 and 12.5	Aggregate Type (Note 2)			
			Type (G)	Type (D)	Type (M)	Type (T)
			Superpave 12.5FC 1 Only	Superpave 12.5FC 1 and 12.5FC 2, and SMA 9.5 and 12.5		
LS-601	Wash Pass 75µm sieve, Guideline B, % maximum loss	1.3 (Note 3)	1.0	1.0	1.0	1.0
LS-604	Absorption, % maximum	2.0	1.0	1.0	1.0	1.0
LS-609	Petrographic Number, (HL) maximum	-	(Note 4)			
			120	145	145	120
LS-613	Insoluble Residue, retained 75µm sieve, % minimum	-	-	45 (Note 5)	-	-
LS-614	Unconfined Freeze-Thaw, % maximum loss	6 (Note 6)	(Note 4)			
			6	7	6	6
LS-618	Micro-Deval Abrasion, % maximum loss	17 (Note 7)	(Notes 4 and 7)			
			10	15	15	10
<b>Alternative Requirement for LS-614</b>						
LS-606	Magnesium Sulphate Soundness, % maximum loss	12 (Note 6)	-			

Notes for Table 2:

1. As specified in LS-600, the aggregate used for the following tests shall be prepared by first splitting off sufficient quantities of each of the aggregate components, based on their individual percentages stated in the mix design and the overall blended quantity required for the test(s). Then, with the exceptions of RAP and RST, the split portions of each of the other aggregate components shall be placed in a vessel of appropriate size and blended together by mixing. The blended aggregate shall then be split on the 4.75 mm sieve and the portion retained on the 4.75 mm sieve set aside for testing.
2. Aggregate Types (G), (D), (M) and (T) refer to the Designation Type included in the "Product Description and Designation Type" column for each source listed on DSM #3.05.25.
3. When quarried rock is used as a source of at least one coarse aggregate in the mix, a maximum of 2.0 percent passing the 75 µm sieve shall be permitted.
4. When this test is being carried out on the coarse aggregate fraction of a Superpave 12.5FC 1 that contains coarse aggregates from more than one source, the minimum value of the % maximum losses shown below for the coarse aggregate categories that are included in that mix shall be used for acceptance.
5. The following requirements shall be met:
  - i) The average value of two test results carried out on separate samples shall have a minimum insoluble residue of 45%. Each of the two samples shall be prepared by blending one of the two primary coarse aggregate stockpile samples, specified in part a) of the Sampling subsection with each of the remaining aggregates in the mix, excluding RAP and/or RST, according to Table 2, Note 1.
  - ii) The insoluble residue, determined from part i) above, minus the insoluble residue from the aggregates extracted from the HMA sample, shall meet the requirements specified in Table 4, Note 8.
6. For Superpave 9.5 and Superpave 12.5, the Owner shall waive the requirements for LS-614, Unconfined Freeze-Thaw, provided the Contractor has submitted a written request that the coarse aggregate meet the alternative requirements for LS-606, Magnesium Sulphate Soundness.
7. In addition to the requirements shown below, the Micro-Deval Abrasion loss for any individual aggregate component where the aggregate retained on the 4.75 mm sieve represents more than 5% of the overall mix design gradation, by mass, shall not exceed 25%.

**Table 3**  
**Physical Property Requirements for Combined HMA Aggregates in Binder and Levelling Courses**  
**- Fraction Retained on the 4.75 mm Sieve (Note 1)**

<b>MTO Test Number</b>	<b>Laboratory Test</b>	<b>Superpave 9.5, 12.5, 19.0, 25.0, &amp; 37.5 and SMA 19.0</b>
LS-601	Wash Pass 75µm sieve, Guideline B, % maximum	1.3 (Note 2)
LS-604	Absorption, % maximum	2.0
LS-614	Unconfined Freeze-Thaw, % maximum loss (Note 3)	15
LS-618	Micro-Deval Abrasion, % maximum loss	21 (Note 4)
<b>Alternative Requirement for LS-614</b>		
LS-606	Magnesium Sulphate Soundness, % maximum loss (Note 3)	15

Notes for Table 3:

1. As specified in LS-600, the aggregate used for the following tests shall be prepared by first splitting off sufficient quantities of each of the aggregate components, based on their individual percentages stated in the mix design and the overall blended quantity required for the test(s). Then, with the exceptions of RAP and RST, the split portions of each of the other aggregate components shall be placed in a vessel of appropriate size and blended together by mixing. The blended aggregate shall then be split on the 4.75 mm sieve and the portion retained on the 4.75 mm sieve set aside for testing.
2. When quarried rock is used as a source of at least one coarse aggregate, a maximum of 2.0 percent passing the 75µm sieve shall be permitted.
3. The Owner shall waive the requirements for LS-614, Unconfined Freeze-Thaw, provided that the Contractor has submitted a written request that the coarse aggregate meet the alternative requirements for LS-606, Magnesium Sulphate Soundness.
4. In addition to the requirements shown below, the Micro-Deval Abrasion loss for any individual aggregate component where the aggregate retained on the 4.75 mm sieve represents more than 5% of the overall mix design gradation, by mass, shall not exceed 25%.

**Table 4**  
**Physical Property Requirements for Aggregates Extracted From HMA** (Note 1)

MTO Test Number	Laboratory Test	Surface Course			Binder and Levelling Course
		Superpave 12.5FC 2, SMA 9.5 and 12.5	Superpave 12.5FC 1	Superpave 9.5 and 12.5	Superpave 9.5, 12.5, 19.0, 25.0, 37.5, and SMA 19.0
<b>Passing the 4.75 mm Sieve / Retained on the 2.36 mm Sieve</b>					
LS-613	Acid Insoluble Residue, retained on 75 µm sieve, % minimum (Note 2)	-	-	60.0	-
LS-616, Part B	Category 1 aggregates, % minimum (Note 3)	90.0	-	-	-
<b>Retained on the 4.75 mm Sieve</b>					
LS-608	Flat and Elongated Particles, % maximum (4:1)	15	15	20	20
LS-609, Part B	Category 1 aggregates, % minimum (Note 3)	90.0	90.0	-	-
	Category 2 aggregates, % maximum (Notes 2, 4)	-	-	40	
	Category 2 AND Category 5 aggregates, % maximum (Note 5)	5.0	5.0	-	
	Category 3 Contaminants, % maximum (Note 6)	0.5	0.5	0.5	
LS-613	Acid Insoluble Residue, retained on 75 µm sieve, % minimum	<b>Types (G), (M) or (T) Primary Coarse Aggregate</b>			-
		90.0 (Note 7)	90.0 (Note 7)		
		<b>Type (D) Primary Coarse Aggregate</b>			
		45.0	45.0		
		15, 12, 10 (Note 8)	15, 12, 10 (Note 8)		

Notes for Table 4:

1. Aggregates used for the following tests shall be extracted from hot mix using LS-282 and then split on the 4.75 mm sieve, prior to testing.
2. This requirement is only applicable to surface courses placed on the Thousand Islands Parkway; Highway 33 from west of Bath to Picton; Highway 35 from County Road 121 northerly to Norland; and in 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 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.
3. Category 1 aggregates shall include:
  - a. For the fraction passing the 4.75 mm sieve and retained on the 2.36mm sieve, all Category 1 aggregates

- or their acceptable major mineral components or both listed on the Part B form in LS-616.
- b. For the fraction retained on the 4.75 mm sieve, the following rock types, when classified according to the descriptions given in LS-609, Appendix:
    - i) Rock types 3, 4, 5, 6, 7, 8, 9, 10, 11, 22 AND
    - ii) For mixes with a (G), (M) or (T) primary coarse aggregate, up to 12.5% rock types 25, 27, 29 and 30 (i.e. the actual percentage of these rock types in that fraction may be greater than 12.5%, provided there is a minimum of 77.5% of the rock types shown in i); OR
    - iii) For mixes with a (D) primary coarse aggregate, rock types 1, 2, 20 and 21.
4. Category 2 aggregates shall include the following rock types, when classified according to the descriptions given in LS-609, Appendix:
- a. For mixes where the primary coarse aggregate is from a carbonate or dolomitic sandstone source:
    - i) Rock types 23, 24, 26, 35, 40, 41, 42, 43, 44, 45, 49; AND
    - ii) Rock types 1, 2, 20, 21, where the siliceous component determined by petrographic analysis (i.e. and confirmed by insoluble residue testing using LS-613, when the Petrographic Analyst is unsure) is less than 45%.
  - b. For mixes where the primary coarse aggregate is not from a carbonate or dolomitic sandstone source, rock types 1, 2, 20, 21, 23, 24, 26, 35, 40, 41, 42, 43, 44, 45 and 49.
- In the event of a dispute based on the petrographic testing described above, the extracted coarse aggregates must have at least 60% insoluble residue retained on the 75 µm sieve, in accordance with LS-613.
5. This requirement shall only apply to mixes with primary coarse aggregate types (G), (M) or (T) and where the mix design submission indicates that any RAP in the mix does not contain dolomitic sandstone retained on the 4.75 mm sieve (i.e. the RAP does not contain rock types 3 and/or 22, according to the descriptions given in LS-609, Appendix or, when present, fine powder obtained from scratching those materials does not effervesce, when subjected to 5% HCl by volume) and shall include all:
- a. Category 2 aggregates, as specified in Note 4 b); and
  - b. Category 5 aggregates consisting of the following rock types, according to the descriptions given in of LS-609, Appendix: types 28, 32, 34, 46, 48, 50, 51, 52, 53, 54, 55, 56, 60, 61, 62, 63, 64, 71, 73, 74, 77, 78, 79, 80, 82, 83, 84, 85, 86, 87, 88, and 97 as well as any other rock types that do not fall under Categories 1, 2 or 3.
- In the event of a dispute based on the petrographic testing described above, then the extracted coarse aggregates must have at least 95% insoluble residue retained on the 75 µm sieve, in accordance with LS-613.
6. Category 3 contaminants include but are not limited to clay and soluble minerals, clay lumps, earth, wood, crack sealant as well as all waste materials such as gypsum, plaster, gypsum/plastic wallboard, hydraulic cement concrete, clay brick, tile, coal, fly ash, cardboard, paper, metals, slags, glass, ceramics, soluble minerals, paint, rubber, etc.
7. For mixes with primary coarse aggregate types (G), (M) or (T) and where, in the mix design submission, petrographic testing in accordance with LS 609 Part b), clearly indicates that any RAP in the mix contains dolomitic sandstone (i.e. the material contains rock types 3 and/or 22, according to the descriptions given in LS-609, Appendix and fine powder obtained from scratching those materials at least slightly effervesces when subjected to 5% HCl by volume) retained on the 4.75 mm sieve.
8. For mixes with a (D) primary coarse aggregate, the % insoluble residue retained on the 75 µm sieve, determined from the average of TWO blended samples of aggregates [i.e. see Table 2, Note 5, part i)] MINUS the % insoluble residue retained on the 75 µm sieve for the coarse portion of the aggregate extracted from the HMA sample, shall not exceed:
- i) 15% by mass for mixes containing RAP that has at least 10% its aggregates retained on the 4.75 mm sieve;
  - ii) 12% by mass for mixes containing RAP that has less than 10% of its aggregates retained on the 4.75 mm sieve; and
  - iii) 10% by mass for mixes that does not contain RAP.

**Table 5**  
**Consensus Property Requirements for HMA Coarse and Fine Aggregates**  
**Including RAP or RST or Both (Note 1)**

Traffic Category	Combined Aggregates Passing the 4.75 mm Sieve			Combined Aggregates Retained on the 4.75 mm Sieve		
	AASHTO T 176 Sand Equivalent Method 1, % minimum (Note 2)	LS-629 Uncompacted Void Content, % minimum		ASTM D 4791 Flat and Elongated Particles, % maximum at 5:1	ASTM D 5821 Fractured Particles in Coarse Aggregate, % minimum (Note 4)	
		≤ 100mm (Note 3)	> 100mm (Note 3)		≤ 100 mm (Note 3)	> 100 mm (Note 3)
A	40	-	-	-	55/-	-/-
B	40	40	40	10	75/-	50/-
C	45	45 (Note 5)	40		85/80	60/-
D	45	45 (Note 5)	40		95/90	80/75
E	50	45 (Note 5)	45 (Note 5)		100/100	100/100

Notes for Table 5:

- As specified in LS-600, the aggregate used for the following tests shall be prepared by first splitting off sufficient quantities of each of the aggregate components including, with the exception of AASHTO T 176 (i.e. see Note 2.), any aggregates derived from RAP and RST, based on the individual percentages of each aggregate component stated in the mix design and the overall blended quantity required for the test(s). The split portions of each of the aggregate components shall be placed in a vessel of appropriate size and blended together by mixing. The blended aggregate shall then be split on the 4.75 mm sieve and the portions passing and retained on the 4.75 mm sieve set aside for testing.
- When the total combined fine aggregate includes aggregate derived from RAP or RST or both, this requirement shall be met prior to blending with RAP or RST or both.
- Denotes the depth of the top of lift below the final pavement surface. If less than 25% of a layer is within 100 mm of the surface, then the layer may be considered to be below 100 mm.
- 85/80 denotes that 85% of the coarse aggregate has one fractured face and 80% has two or more fractured faces.
- An uncompacted void content of 43% is acceptable, provided that the selected mix satisfies the mix volumetrics specified in the Contract Documents.

**Table 6**  
**Field Sample Size**

<b>Material</b>	<b>Minimum Mass, kg (Note 1)</b>
Fine aggregate	15
Coarse aggregate	25
RAP	10
RST	5
Filler / Baghouse Fines	2
Hot Mix Asphalt	25

Note for Table 6:

1. Individual sample containers shall hold no more than 30 kg of aggregate. When more than 30 kg is required, additional sample containers shall be used.