



## SECTION 1001

### GENERAL REQUIREMENTS FOR MATERIAL

**1001.1** All requirements of [Sec 106](#) will apply to material hereinafter specified. Material or processes requiring pre-qualification or pre-acceptance shall be in accordance with the applicable sections of these specifications. After approval, the material or process will be placed on either the qualified list or the pre-acceptance list (PAL) maintained on MoDOT's web site by Construction and Materials. The contractor shall select materials or processes from the appropriate list for use in MoDOT work. Final acceptance may be based on field inspection.

**1001.2** All packaged material shall be plainly marked showing the quantity and nature of the contents and shall be delivered intact.

**1001.3** A description of the classification of deleterious material may be found in MoDOT's Materials Manual on MoDOT's web site.

**1001.4** Chat will be defined as aggregate tailings from mills in which metallic minerals have been recovered.

**1001.5** Crushed stone will be defined as the product obtained by the artificial reduction in the size of rock that has been mined or excavated from ledge formation. Chat as defined in [Sec 1001.4](#) is not included.

**1001.6** Gravel will be defined as the coarse granular material, generally considered as material retained on the No. 4 or No. 10 (4.75 mm or 2.00 mm) sieve, but may include finer sizes, resulting from the natural disintegration and abrasion of rock, or from processing of weakly bound conglomerate. Gravel may include such material that has been further reduced in size by artificial means.

**1001.7** Porphyry will be defined as a fine-grained, dense, igneous rock generally occurring in the Missouri counties of Iron, Madison, St. Francois and their adjacent counties.

**1001.8** Wet bottom boiler slag will be defined as a hard, angular by-product of the combustion of coal in wet bottom boilers.

**1001.9** Sieves specified for gradation requirements shall have openings as prescribed in AASHTO M 92.

**1001.10 Storage and Handling of Aggregate.** Aggregate shall be produced, handled and stockpiled to minimize segregation, degradation and contamination. Regardless of the method of storage and handling, all aggregate that is segregated, degraded or contaminated to the extent that the aggregate does not meet specifications, will be considered unacceptable. Aggregate may be reconditioned by any method that produces satisfactory material.

**1001.11 Approval of Aggregate Sources.** All sources of aggregate shall be evaluated and approved by the engineer for initial approval and source approval as herein prescribed, prior to acceptance of aggregate from that source.

**1001.11.1** Sources of crushed stone shall be evaluated for initial approval on a ledge by ledge basis. Each exposed ledge will be identified, and the ledge boundaries will be described by the engineer. A sample for initial approval will be required from each ledge. Resampling will be required if source approvals or production samples indicate a significant change has occurred.

**1001.11.2** Source approvals will be required a minimum of every two years. Resampling will be required at closer intervals if, in the judgment of the engineer, any significant change has occurred to the source.

**1001.11.3** Sources of natural sand, gravel and manufactured lightweight aggregate shall be evaluated for initial approval, except if a plant-produced product meeting all other specification requirements is available, that product may be evaluated for source approval without first obtaining initial approval. In that case, all initial approvals and all source approval tests will also be performed, and those limits applied to the source approval evaluation.

**1001.11.4** Sources of aggregate such as chat, slag and other by-products from previously produced material or any other undefined sources will be evaluated on an individual basis.

**1001.11.5** Samples of aggregate for source approval shall be taken while the engineer is present and shall be from material produced to meet a specific specification and intended for a specific use.

**1001.11.6** Only approved ledges shall be used in the manufacture of the final product. Approval for use as [Sec 1005](#) Portland cement concrete pavement coarse aggregate will constitute approval for all other uses. Approval for use as [Sec 1005](#) Portland cement concrete masonry coarse aggregate will constitute approval for all uses, except for Portland cement concrete pavement. Approval for use as [Sec 1002](#) asphaltic concrete coarse aggregate will constitute approval for all other uses except for any Portland cement concrete products.

**1001.12 Mining By-Product Aggregate.** Aggregate produced as a by-product from lead or zinc mining operations may be furnished under the following requirements. No blending or dilution of this aggregate with other material will be allowed in order to meet these specifications.

**1001.12.1** The supplier shall separate out all aggregate to be furnished into individual stockpiles not exceeding 5000 cubic yards (4000 m<sup>3</sup>) each. No material will be accepted that has not been moved at least once to a stockpile area specifically for this purpose. The supplier shall randomly sample each stockpile by combining several small samples from the pile into one sample. The sample shall be tested by an approved laboratory for the required lead tests specified in [Sec 1001.12.2](#). A minimum of one set of tests shall be performed for each individual stockpile.

**1001.12.2** For aggregate not encapsulated in asphalt or Portland cement mixtures and delivered to MoDOT construction projects or property, the concentration of leachable lead in the aggregate as determined by Method 1311, *Toxicity Characteristics Leaching Procedures (TCLP)*, 40 CFR 261, Appendix II, shall be less than 3.0 ppm, and the total lead content shall be less than 500 ppm as determined by EPA Method 3050A, *Acid Digestion of Sediments, Sludges, and Soils* (particle size reduced to 1 mm or less). For each individual aggregate meeting [Secs 1002, 1004 and 1005](#) which is encapsulated in asphalt or Portland cement mixtures and delivered to MoDOT construction projects or property, there will be no limit on the leachable lead, but the total lead content shall be less than 4500 ppm. No lead tests will be required and there will be no limits on leachable or total lead content for asphalt or Portland

cement material milled from MoDOT projects and reprocessed into a mixture for re-use on MoDOT projects.

**1001.12.3** Prior to any approval, shipment or use of this material, the supplier shall furnish to the engineer a report of the laboratory test results. The report shall specifically identify the stockpile, estimated quantity, location, date of sample, date of test and the specific test results for each lead test. Attached to the report shall be a certification from the supplier that the material furnished does not exceed the lead amounts specified. The supplier shall test as necessary beyond the requirements of this specification to ensure that this specification is met. All costs for setting the material aside for testing and for testing shall be borne by the supplier.

**1001.13 Dust Suppressants.** Approved dust suppressant additives may be used during the crushing or aggregate handling process provided there is no detrimental effect to the aggregate or subsequent products made from the affected aggregate.

**1001.13.1 Manufacturer and Brand Name Approval.** Prior to approval and use of a dust suppressant additive, the manufacturer shall submit to Construction and Materials a certified test report from an approved independent testing laboratory showing specific test results when tested in accordance with MoDOT Test Method TM 62. The certified test report shall contain the manufacturer's name, brand name of material, date tested, date of manufacture and dosage rate of the additive used. In addition, the manufacturer shall submit to Construction and Materials a sample representing the additive tested by the independent testing laboratory and accompanied by a material data sheet, an MSDS showing the brand name, composition or description of the product, the normal and maximum recommended dosage rates, the manner of identification on containers and a copy of the infrared spectrum. The manufacturer shall certify that the material, when used at or below the maximum dosage rate, does not affect the properties of the aggregate or subsequent products made from the treated aggregate. The manufacturer shall also guarantee that as long as the material is furnished under that brand and designation, the material will be of the same composition as originally approved and will in no way be altered or changed. Upon approval of the additive, the manufacturer and brand name will be placed on a list of qualified dust suppressant additives for aggregate.

**1001.13.2** The aggregate supplier shall keep the inspector advised of the use of any dust suppressant material and shall provide for the inspection of such facilities. No dust suppressant shall be applied above the manufacturer's maximum recommended rate.

**1001.14 Aggregate Quality Control/Quality Assurance.**

**1001.14.1 Scope.** This specification covers the quality control (QC) responsibilities of the aggregate producer and the contractor, and the quality assurance (QA) responsibilities of the engineer for aggregate specified to meet QC/QA provisions. The engineer may test all aggregate at any point in the process up to and including final placement to determine acceptability for use according to contract specifications.

**1001.14.2 Quality Control Plan.** The contractor shall submit the aggregate QC Plan to the engineer prior to supplying any material for the contract.

**1001.14.2.1** Aggregate produced shall be in accordance with all requirements of the QC Plan. Documentation of QC and QA testing shall be provided or be available for any material produced prior to approval of the QC Plan.

**1001.14.2.2** All testing for dispute resolutions shall be performed by an approved laboratory. Approved laboratories shall be independent of the contractor and all project subcontractors or suppliers and shall be AASHTO Accreditation Program certified in the areas of the material being tested.

**1001.14.3 Quality Control.** QC shall be performed in accordance with the QC Plan and the requirements herein.

**1001.14.3.1** Equipment and qualified personnel shall be provided to perform all QC field inspection, sampling and testing in accordance with this specification. Personnel shall be qualified by MoDOT technician certification training, and will be disqualified if acceptable methods and procedures are not followed.

**1001.14.3.2** Samples of each aggregate fraction shall be taken daily for sieve analysis and percent deleterious. When an aggregate fraction daily production is less than 1500 tons (1500 Mg), a minimum of one sample per fraction per day shall be taken. When production exceeds 1500 tons (1500 Mg), a minimum of two samples per fraction per day shall be taken.

**1001.14.3.3** As a minimum, samples for coarse and fine aggregate angularity, clay content, thin and elongated particles, liquid limit, plastic limit and plasticity index, if applicable, shall be obtained every 10,000 tons (4536 kg) or fraction thereof.

**1001.14.3.4** All QC sample test results shall be maintained in an organized format available to the QA inspector at all times. Tests shall be completed within 24 hours on all samples obtained.

**1001.14.3.5** One half of each QC sample shall be identified and retained by the aggregate producer for seven days for QA testing. The retained sample shall be the remaining half of the final reduction in sample size obtained for QC testing. The retained sample's identification shall consist of, but will not be limited to:

- (a) Time and date sampled.
- (b) Product specification number.
- (c) Type of sample, i.e. belt, bin, stockpile.
- (d) Test results.
- (e) Sampler/Tester

**1001.14.3.6 Quality Control Laboratory.** All QC testing shall be performed in an approved Type 1 field laboratory in accordance with [Sec 601](#).

**1001.14.3.6.1** All significant testing equipment shall be calibrated or verified in accordance with the following limits:

<b>Equipment</b>	<b>AASHTO Test Method</b>	<b>Requirement</b>	<b>Interval (Month)</b>
Mechanical Shakers	T 27	Check Sieving Thoroughness	12
Sieves	--	Check Physical Condition	6
Weighted Foot Assembly	--	Check Weight	12
Mechanical Shaker	T 176	Check Rate and Length of Throw	12
Liquid Limit Device	T 89	Check Wear & Critical Dimensions	12
Grooving Tool	T 89	Check Critical Dimensions	12
Ovens	--	Verify Temp. Settings	4
Balances	--	Verify	12 <sup>a</sup>
Timers	--	Check Accuracy	6

<sup>a</sup>Calibrate or verify after each move

**1001.14.3.6.1.1** An inventory of all major sampling, testing, calibration and verification equipment, including the serial number or other identifying number, shall be maintained.

**1001.14.3.6.1.2** Calibration and verification records shall include, but will not be limited to:

- (a) Detailed results of work performed (dimensions, mass, force, temperature, etc.).
- (b) Description of the equipment calibrated, including identifying number.
- (c) Date the work was performed.
- (d) Identification of the individual performing the work.
- (e) Identification of the calibration or verification procedure used.
- (f) The previous calibration or verification date and next due date.
- (g) Identification of any in-house calibration or verification device used (including identification to establish traceability of items such as standard masses, proving rings, standard thermometers, balances, etc.).

**1001.14.3.6.2** Test records shall be maintained to permit verification of any test report.

**1001.14.3.6.3** Records pertaining to testing, equipment calibration and verification, test reports, internal quality systems review, proficiency sample testing, test technician training and evaluation, and personnel shall be retained in a secure location for a minimum of three years.

**1001.14.3.6.4** A current copy of all test methods and procedures shall be maintained in the QC laboratory at all times.

**1001.14.3.6.5** Examples of report formats and procedures may be found in AASHTO R 18.

**1001.14.4 Quality Assurance.** The QA inspector will test at least five percent of the retained samples to assure the quality of the material. Retained samples will be chosen at random. The QA inspector will keep a written record of test results and provide one copy of the results in an easily accessible location for both the aggregate and mixture producer's use.

**1001.14.4.1** The engineer will submit production samples to the Central Laboratory in accordance with MoDOT's Materials Manual.

**1001.14.4.2** All QA field inspection, sampling and testing will be performed by a MoDOT qualified technician. The QA inspector shall have free access to any and all testing equipment used by the aggregate producer and any workbooks, records or control charts maintained by the aggregate producer for the QC process. The QA inspector shall also have sufficient access to the quarry grounds in order to assure compliance with the approved QC Plan.

**1001.14.4.3** The engineer will independently sample and test the aggregate a minimum of every third day of production for gradation and deleterious. Other tests, that may include samples for coarse and fine aggregate angularity, clay content, thin and elongated particles, and plasticity index, if applicable, will be independently sampled at least once every 20,000 tons (4536 kg) or a minimum of once per project. A copy of the engineer's test results, including all raw data, will be provided to the producer upon completion of the test.

**1001.14.4.4** Comparison for aggregate will be considered favorable when the test results of the engineer's independent sample meet specifications, and when the contractor's QC test results and the engineer's QA test results of a retained sample compare within the following limits.

**1001.14.4.4.1 Gradation.**

Sieve Size	Percentage Points
3/4 inch (19 mm) and larger	5.0
1/2 inch (12.5 mm)	5.0
3/8 inch ( 9.5 mm)	4.0
No. 4 (4.75 mm)	4.0
No. 8 (2.36 mm)	3.0
No. 10 (2.00 mm)	3.0
No. 16 (1.18 mm)	3.0
No. 20 (850 μ m)	3.0
No. 30 (600 μ m)	3.0
No. 40 (425 μ m)	2.0
No. 50 (300 μ m)	2.0
No. 100 (150 μ m)	2.0
No. 200 (75 μ m)	1.0

**1001.14.4.4.2 Coarse Aggregate Angularity.** Angular particles shall be within 5 percentage points.

**1001.14.4.4.3 Fine Aggregate Angularity.** Void content shall be within 2 percentage points.

**1001.14.4.4.4 Sand Equivalent.** Sand equivalency shall be within 5 percentage points.

**1001.14.4.4.5 Thin, Elongated Particles.** Flat, elongated particle content shall be within one percentage point.

**1001.14.4.4.6 Deleterious.** The total and individual deleterious content shall not exceed the specification limits.

**1001.14.4.4.7 Plasticity Index.** The plasticity index shall be within two. No tolerance shall be allowed for material when the material is specified to be non-plastic.

**1001.14.4.5** Performance and acceptance of QC/QA testing will not eliminate any FHWA requirements necessary for acceptance of the material.