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Standard Practice for Reclamation of Recycled Aggregate Base (RAB) Material[1]

This standard is issued under the fixed designation D8038; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers selected aspects for reclamation of recycled aggregate base (RAB) material derived from asphalt pavement or concrete. RAB may be called recycled asphalt pavement (RAP) or recycled concrete aggregate (RCA).

1.2 This practice is provided related to material quality, material quality control testing, and also operator and facility qualifications.

1.3 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

NOTE 1—Sieve size is identified by its standard designation in Specification E11. The alternative designation given in parentheses is for information only and does not represent a different standard sieve size.

1.4 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.5 This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title means only that the document has been approved through the ASTM consensus process.

2. Referenced Documents

2.1 *ASTM Standards:*

C117 Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates

C535 Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

C702 Practice for Reducing Samples of Aggregate to Testing Size

D8 Terminology Relating to Materials for Roads and Pavements

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D75 Practice for Sampling Aggregates

D2940 Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports

D6307 Test Method for Asphalt Content of Asphalt Mixture by Ignition Method

D6928 Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of common technical terms in this standard, refer to Terminology D653 and D8.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *asphalt/concrete recycling facility (facility), n*—the physical plant (or plants) where disposed asphalt and concrete are received, processed, tested, and stockpiled. This may include separate transfer locations.

3.2.2 *asphalt/concrete recycling operator (operator), n*—the company or companies that receive disposed asphalt and concrete material and transform these materials into a finished recycled aggregate product.

3.2.3 *recycled aggregate base (RAB), n*—aggregate derived from processed/crushed asphalt or concrete pavement or structural concrete.

4. Significance and Use

4.1 Use of recycled aggregate base has become commonplace in transportation applications.

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.14 on Geotechnics of Sustainable Construction.

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4.2 RAB may be used alone or in mixtures with other aggregate materials (virgin and/or recycled) in the production of unbound base course materials.

4.3 Quality of RAB is critical for successful reuse in pavement base applications. This practice is intended to provide a common baseline framework for assuring material, operator, and facility quality for production of RAB.

5. Material Quality Specifications

5.1 *General*—The material quality specifications are designed to ensure that the operator and the facility produce a RAB product that meets appropriate, generic quality specifications. Therefore, the limits contained within this ASTM standard may be considered as minimum quality standards. Individual RAB users and local agencies may make their individual RAB specifications more stringent than what is provided herein to meet local requirements.

NOTE 2—RAB has an established history of use in construction and is considered a nonhazardous recyclable material (after Texas Department of Transportation, "DMS-11000 Evaluating and Using Nonhazardous Recyclable Materials Guidelines," ftp://ftp.dot.state.tx.us/pub/txdot-info/cst/DMS/11000_series/pdfs/11000.pdf, 2014) as long as it has not come into contact with any hazardous materials.

5.2 The requirements for as-delivered (that is, incoming) materials are:

5.2.1 Only disposed asphalt and concrete free of significant impurities, deleterious materials such as wood, metal, plaster, rubbery material (for example, tires, carpet pads), glass, and geosynthetics, and inclusions are admissible for producing recycled aggregate. The recycled aggregate is derived from processed/crushed asphalt or concrete pavement or structural concrete, including reclaimed asphalt, hydraulic cement concrete, lean concrete base, cement treated base, or natural aggregates. The recycled aggregate materials shall be clean, hard, sound, durable, and uniform in quality. Overall, all incoming materials shall be largely free from reinforcing steel, trash; wood; roots; vegetation; soft, friable, thin, elongated or laminated pieces; disintegrated material; and hazardous materials, and also shall be free from solvents or other contaminating substances.

5.2.2 Each incoming load of asphalt and/or concrete shall be visually inspected at the facility for deleterious materials prior to loading materials to the crusher.

5.3 The requirements for finished product are:

5.3.1 The final recycled aggregate shall be free (total of no more than 1 % by mass) of organic and deleterious materials such as wood, metal, plaster, rubbery material (for example, tires, carpet pads), glass, and geosynthetics, when these materials are not classified as solid waste.

5.3.2 The final recycled aggregate may contain clay brick or clay tile up to 20 % by weight. Users can specify a different value for brick or clay tile content.

5.3.3 The final recycled aggregate product shall conform to the gradation requirement given in Table 1 based on ASTM D2940 and shall be of such nature that it can be compacted readily under watering and rolling to form a firm stable base.

NOTE 3—Additional material characteristics also can be specified for RAB. Durability can be evaluated and having a loss of no more than 50 % by the Los Angeles abrasion test (following C131 or C535 as appropriate) can be used for guidance. For RAP with binder and/or asphalt content, having a loss of no more than 20 % by the Micro-Deval test (following D6928) can be used as guidance. The asphalt content (determined using D6307) of the final recycled aggregate product also may be specified. In addition, if the incoming material is sourced from concrete known to have experienced either D-cracking or alkali silica reaction (ASR), freeze/thaw durability and alkali-reactivity of the recycled aggregate product can be determined. Furthermore, the ratio of RAB in a mixture with other aggregates may be specified based on intended end use.

6. Sampling and Testing for Gradation and Deleterious Materials

6.1 Sample each finished product, in accordance with Practice D75 or in accordance with the requirement of the governing transportation agency. Sampling shall be done at a rate established by the local transportation agency or at a rate of two samples per day per active stockpile. Thoroughly mix the sample and reduce it to an amount suitable for testing using the applicable procedures described in Practice C702. The sample for the test shall be approximately the quantity desired when dry and shall be the end result of the reduction procedure. Reduction to an exact predetermined quantity is not required.

6.2 Perform gradation testing on two separate specimens obtained from each reduced sample. Gradation testing shall be conducted in conformance with ASTM C117 and C136 with the exception that the drying temperature shall not exceed 60°C for recycled asphalt pavement. Gradation testing shall be performed after separating deleterious materials.

6.3 Determine mass percentage of deleterious materials for each gradation specimen. Identify deleterious materials by

TABLE 1 Aggregate Grading Requirements for RAB (ASTM D2940)

Sieve Size[A]	Design Range (Percentage Passing by Mass)		Tolerances (Percentage Passing by Mass)	
	Bases	Subbases	Bases	Subbases
50.0 mm (2 in.)	100	100	–2	–3
37.5 mm (1.5 in.)	95-100	90-100	±5	±5
19.0 mm (0.750 in.)	70-92		±8	
9.5 mm (0.375 in.)	50-70		±8	
4.75 mm (No. 4)	35-55	30-60	±8	±10
0.60 mm (No. 30)	12-25		±5	
0.075 mm (No. 200)	0-8	0-12	±3	±5

[A]Sieve size is identified by its standard designation in Specification E11. The alternative designation given in parentheses is for information only and does not represent a different standard sieve size.

visual inspection and determine their mass as percentage of the mass of total specimen used for gradation testing (see 6.2).

6.4 Average values of all sieve size determinations and deleterious materials percentages for all samples shall comply with the requirements above. Noncompliance shall necessitate the entire stockpile to be rejected.

7. Operator and Facility Qualifications

7.1 *General*—Operator shall:

7.1.1 Secure a supply of reclaimed asphalt and concrete, stockpile it, process/crush the material, and test and stockpile the RAB product.

7.1.2 Be compliant with local, state, and federal solid waste management rules, laws, and regulations.

7.1.3 Be compliant with air quality requirements and other relevant local, state and federal rules, laws and regulations.

7.1.4 Have the necessary plans in place for protecting worker health/safety and the environment.

7.1.5 Meet recycled aggregate material quality standards specified herein prescribed to ensure optimum performance when used in the construction of roads, highways, foundations, and other structures.

7.1.6 Meet other stockpiling, sampling, and testing requirements specified herein.

7.1.7 Be compliant with any local, state, and federal solid waste management plan.

7.1.8 Be compliant with any other additional local solid waste handling regulations or requirements.

7.1.9 Be compliant with all local, state, and federal standards and have notified the jurisdictional health department that the facility is crushing asphalt and/or concrete.

7.1.10 Have in place a workplace accident prevention program that addresses workplace hazards in accordance with state and federal requirements.

7.1.11 Provide certification as presented in the Appendix X1.

8. Keywords

8.1 recycled aggregate base; recycled asphalt pavement; recycled concrete aggregate

APPENDIX

(Nonmandatory Information)

X1. FACILITY AND MATERIAL CERTIFICATION FORM

X1.1 See Fig. X1.1.

Facility and Material Certification Form

To be completed by the the asphalt/concrete recycling operator

Company Name: _____

Address: _____

_____

_____

Contact Name: _____

Phone: _____

E-mail: _____

We the undersigned, certify that:

1. The facility is compliant with its solid waste management plan within the local jurisdiction.
2. The facility is compliant with other local, state, and federal solid waste handling regulations or requirements.
3. The facility is permitted as a solid waste handling facility [if needed].
4. The operator has notified the appropriate regulatory agency or agencies with jurisdiction in that locality that the facility is crushing asphalt and/or concrete.
5. The facility has in place a workplace accident prevention program that addresses workplace hazards in accordance with local, state, and federal regulations. The plan addresses asbestos hazards.
6. Incoming loads of asphalt concrete are inspected by a qualified inspector.
7. The final recycled aggregate conforms to the gradation and material quality specifications given in this standard.
8. RAB has an LA abrasion test loss of _____% or RAB has a Micro-Deval test loss of _____% (if required by customer).
9. RAB has an asphalt content of _____% (if required by customer).

_____ _____

Base aggregate recycling operator (signature) Date

Print Name

FIG. X1.1 Facility and Material Certification Form