



Designation: D5603 – 23

Standard Classification for Rubber Compounding Materials—Recycled Vulcanizate Rubber¹

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1. Scope

1.1 This classification covers the compounding material commercially known as recycled vulcanizate particulate rubber. Recycled vulcanizate particulate rubber is the product that results when vulcanizate rubber has been processed by some means to obtain a desired particle size distribution.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D297 Test Methods for Rubber Products—Chemical Analysis](#)

[D1509 Test Methods for Carbon Black—Heating Loss](#)

[D1566 Terminology Relating to Rubber](#)

[D5644 Test Method for Rubber Compounding Materials—Determination of Particle Size Distribution of Recycled Vulcanizate Particulate Rubber](#)

[D8268 Practice for Rubber Compounding Materials—Evaluation of Recycled Vulcanizate Particulate Rubber](#)

¹ This classification is under the jurisdiction of Committee D11 on Rubber and Rubber-like Materials and is the direct responsibility of Subcommittee D11.27 on Rubber Sustainability.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[E1131 Test Method for Compositional Analysis by Thermogravimetry](#)

3. Terminology

3.1 *Definitions:*

3.1.1 *recycled vulcanizate particulate rubber, n*—recyclable vulcanizate rubber that has been processed to give particulates or other forms of different shapes, sizes, and size distributions.

3.1.2 *particulate rubber, n*—rubber, vulcanized or unvulcanized, that has been transformed into a collection of particles, with or without a coating of a partitioning agent to prevent agglomeration during production, transportation, or storage (see buffing rubber, granulated rubber, ground rubber, and powdered rubber). **D1566**

3.1.3 *granulated rubber, n*—particulate rubber composed of mainly non-spherical particles that span a broad range of maximum “particle dimension” from below 425 μm (40 mesh) to 12 mm (0.47 in.); the key feature of this type of particulate rubber is the fraction of the material in the greater than 1-mm (0.08-in.) up to 12-mm (0.47-in.) maximum “particle dimension” range. **D1566**

4. Significance and Use

4.1 Recycled vulcanizate particulate rubber is important in rubber compounding. It allows the rubber compounder to add a certain percentage of rubber filler back into its parent or similar compounds or to use the material as substitute or stand alone compound. Its use may lower compound costs or improve performance characteristics, or both.

4.2 Many types of recycled vulcanizate particulate rubber are available, with the number of types of vulcanizate particulate rubber limited only by the number of parent compounds.

4.3 Recycled vulcanizate particulate rubber is used as feedstock for thermal decomposition, devulcanization, recovered carbon black, tire-derived aggregate, synthetic turf infill, asphalt-rubber, molded rubber products, tire-derived fuel, and other tire and non-tire derived products and end uses.

4.4 Use of recycled rubber has a positive environmental impact.

5. Classification of Recycled Vulcanizate Particulate Rubber

5.1 The classification of recycled vulcanizate particulate rubber is based on two major characteristics: the classification of the source of rubber (Table 1) and the particle size distribution of the particulate rubber (Table 2).

5.2 Particle size distribution is further identified by the range of sizes of particulate material starting with a maximum designated size.

5.2.1 In industry practice, granulated rubbers typically range in particle sizes from 2.0 mm (10 mesh) to 425 μm (40 mesh) regardless of polymer type present in the recycled vulcanizate rubber or the method of processing (Table 2).

5.2.2 Fine rubber powders are products with designations smaller (finer) than 1.0 mm (18 mesh). These materials typically range in particle sizes from less than 600 μm (30 mesh) to less than 75 μm (200 mesh) regardless of polymer type present in the recycled vulcanizate or the method of processing (Table 2B).

5.3 Classification by Source of Rubber:

5.3.1 Table 1 captures the significant classifications and category descriptions of tire and non-tire rubber. The eight classifications are represented by category descriptions that

include highway and non-highway tires; passenger car tires, light truck, truck, bus, agriculture, off-the-road (OTR) tires; tire tread, shoulders and sidewalls; and non-tire rubber. Recycled tire-derived material (TDM) and non-TDM feedstock are derived through a variety of processes using an array of equipment that can handle the various types of tire and non-tire rubber classifications. Some equipment processors may handle only truck tires, passenger tires, OTR tires or tread or any combination of category descriptions in Table 1. The demand for specific feedstock sources of tire and non-tire rubber and specific sizes are determined by the type of equipment and use as a feedstock in the manufacture of vulcanized and devulcanized products or end uses, or both. The classification and polymer type are to be agreed on by the customer, rubber feedstock supplier, manufacturer, or compounder, or a combination thereof.

5.4 Classification by Particle Size:

5.4.1 Table 2 is designed to assist in the classification of particulate rubber that has been reduced in size to a limited maximum size. Table 2 is divided into two sections: (1) Table 2A represents recycled rubber material designation coarse sizes to a minimum particle size of 1 mm and (2) Table 2B is for material smaller than 1 mm.

TABLE 1 Classification by Source of Rubber

Classification	Source of Rubber	Pass- enger Car Tires	Light Truck Tires	Truck Tires	Bus Tires	Agri- culture Tires	Off-the- Road Tires	Non- Tire Rubber
Classification 1	Whole tire recycled vulcanizate particulate rubber is prepared from all highway tires:							
1A	Passenger car, light truck, truck, bus, agriculture, Off-the Road (OTR) tires;	X	X	X	X	X	X	
1B	Truck, bus, and agriculture tires.			X	X	X		
Classification 2	Whole tire recycled vulcanizate particulate rubber is prepared from all highway tires:							
2A	Passenger car, light truck, truck and bus tires;	X	X	X	X			
2B	Passenger car, light truck and truck tires;	X	X	X				
2C	Passenger car and light truck tires;	X	X					
2D	Truck tires and bus tires;			X	X			
2E	Truck tires;			X				
2F	Bus tires.				X			
Classification 3	Whole tire recycled vulcanizate particulate rubber is prepared from non-highway tires:							
3A	Agriculture tires and OTR tires;					X	X	
3B	Agriculture tires;					X		
3C	Agriculture and OTR tires;					X	X	
3D	OTR tires.						X	
Classification 4	Tread only recycled vulcanizate particulate from all highway tires:							
4A	Passenger car, light truck, truck and bus tires.	X	X	X	X			
Classification 5	Tread only recycled vulcanizate particulate from non-highway tires:							
5A	OTR tires.						X	
Classification 6	Tread and shoulder recycled vulcanizate particulate rubber from the retread process to produce buffings from highway tires:							
6A	Passenger, light truck, truck and bus tires;	X	X	X	X			
6B	Truck and bus tires.			X	X			
Classification 7	Tread, shoulder and sidewall recycled vulcanizate particulate rubber from the retread process to produce buffings from highway tires:							
7A	Passenger, light truck, truck and bus tires;	X	X	X	X			
7B	Truck and bus tires.			X	X			
Classification 8	Non-tire recycled vulcanizate particulate rubber from non-tire rubber products							
8A	Non-tire rubber.							