GM	ENGINEERING STANDARDS	Material Specification General	GMN10031 Draft B

Thermoplastic Polyolefin - Recycled Rubber Modified

1 Scope

This specification describes the requirements of thermoplastic materials modified with tire-derived recycled rubber.

Materials qualified to this specification shall have a minimum of 25% recycled content by weight as defined by GM3116, Appendix C.

1.1 Material Description.

To fully describe the material, a type must follow the specification number.

Type I – 60% recycled rubber with 40% high-density polyethylene binder.

Type II – 40% recycled rubber with 60% thermoplastic polyolefin elastomer.

Type III – 70% recycled rubber with 30% thermoplastic polyolefin elastomer.

1.2 Typical Application.

Typical applications include air baffles, closeouts, mudflaps and shields.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D 412	ASTM D 471
ASTM D573	ASTM D 624
ASTM D 814	ASTM D 1329
ASTM D 1414	ASTM D 2240
ASTM D 3182	ASTM D 6147

2.2 GM Specifications.

ASTM D 412	ASTM D 471
ASTM D573	ASTM D 624
ASTM D 814	ASTM D 1329
ASTM D 1414	ASTM D 2240
ASTM D 3182	ASTM D 6147

3 Requirements

Important physical, mechanical and thermal properties that characterize the material are summarized in Table 1. The material shall conform to all applicable drawing specifications.

Tests shall be conducted using the latest issue of the test methods indicated. Suitable precautions shall be taken to ensure that applicable safe limits are not exceeded when conducting test procedures, processes, and/or handling the materials required by this specification.

3.1 Requirements on Test Specimens.

Unless otherwise specified, test specimens shall be die cut from extruded or molded test sheets using the same cure cycle as the production parts. Test sheets shall have a nonimal thickness of 3.2 ± 0.2mm. Type I material has no grain direction. Type II and Type III die cut specimens are to be tested in both parallel (i.e. with the long axis of the test specimen parallel to the direction of flow) and perpendicular directions. Test sheet dimensions must be sufficient to permit this.

Tests shall be conducted 40 hours minimum after molding and immediately following a conditioning period of 24 hours minimum at 22 ± 3°C and 50 ± 5% relative humidity. All tests shall be performed on unannealed specimens in a controlled atmosphere of 22 ± 3°C and 50 ± 5% relative humidity unless otherwise specified. In addition, tests specified at temperatures below or above 22 ± 3°C shall be conducted at the specified temperature using specimens conditioned at the specified temperature for 4 hours minimum.

3.2 Material Property Requirements. See Table 1.

Table 1: Material Property Requirements

Property	Test Method	Unit	Type I	Type II	Type III
Specific Gravity	ASTM D 279		1.00 - 1.04	1.00 - 1.04	1.02 - 1.06
Hardness	ASTM D 2240, 15 second delay	Shore A	90 ± 5	90 ± 5	80 ± 5
Tensile Strength	ASTM D 412, Die C, 500 mm/min		8.5 min		
Grain Direction		MPa		5.5 min	4.5 min
Across Grain Direction				5.0 min	4.0 min
Elongation at Break	ASTM D 412, Die C, 500 mm/min		40 min		
Grain Direction		%		100 min	100 min
Across Grain Direction				100 min	100 min
Modulus at 100% Elongation (grain direction)	ASTM D 412, Die C, 500 mm/min	MPa	NA	5.0 min	3.5 min
Flexural Modulus	ASTM D 412, Die C, 2 mm/min	MPa	min	min	min
Tear Strength	ASTM D624, Die B, 500 mm/min		50 min		
Grain Direction		kN/m		40 min	30 min
Across Grain Direction				40 min	30 min
Staining Resistance	ASTM D 925, Methods A & B, 96 hours		no staining	no staining	no staining
Low Temperature Flexibility	ISO 812 type B, -40°C		no cracking	no cracking	no cracking
Ozone Resistance	ISO 1431-1, Procedure A, 336 hours, 100 pphm, 40°C. Use across grain specimens for Type II & Type III.				
Visual Assessment			Zero Rating	Zero Rating	Zero Rating
Tear Strength		kN/m	50 min	40 min	30 min
Heat Aging Resistance	ASTM D 573, 168 hours at 70°C in an air-circulating oven followed by indicated property testing at 23°. Use across grain specimens for Type II & Type III.				
Hardness Change		points	± 5	± 5	± 5
Tensile Strength Change		%	± 10	± 15	± 15 (25
Elongation Change		%	- 25	± 25	± 25
Tear Strength		kN/m	50 min	40 min	30 min
Long Term Heat Aging Resistance	ASTM D 573, 1008 hours at 70°C in an air circulating oven followed by indicated property testing at 23°. Use across grain specimens for Type II & Type III.				
Hardness Change		points	± 5	± 5	± 5
Tensile Strength Change		%	± 10	± 15	± 15
Elongation Change		%	± 20	± 50	± 50
Tear Strength		kN/m	50 min	40 min	30 min

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 All materials supplied to this specification must comply with the requirements of GMW3001, **Rules and Regulations for Material Specifications**.

5.2 All materials supplied to this specification must comply with the requirements of GMW3059, **Restricted and Reportable Substances for Parts**.

6 Approved Sources

Engineering qualification of an approved source is required for this specification. Only sources listed in the GM Materials File (i.e., MATSPC) under this specification number have been qualified by engineering as meeting the requirements of this specification.

7 Coding System

This material specification shall be referenced in other documents, drawings, VTS, CTS, etc. as follows:

GMN10031, Type N

Where N = I, II, or III

8 Release and Revisions

8.1 Release.

This material specification originated June 2002 and was approved by the Miscellaneous Rubber Group in ???. It was first published in ??? 2002.