



Flexible Expanded Rubber and Rubber-like Materials for Air, Dust, Noise, and Water Sealing

1 Scope

This standard describes the requirements of flexible expanded rubber and rubber-like materials to be used as air and dust seals or water seals and gaskets. These materials may also be used as isolators, rattle protection, covers for gaps and other suitable applications. These materials are typically die cut or slit to width from sheet stock, and may have pressure sensitive adhesive applied to one (1) side.

1.1 Material Description. Materials meeting the requirements of this specification will be comprised of four (4) classes and several types.

1.1.1 Class I: Expanded rubber and rubber-like materials to be used for air, dust and rattle isolators. Materials in this class can be open cell, semi-open cell, semi-closed cell, or closed cell materials.

1.1.2 Class II: Expanded rubber and rubber-like materials to be used for water sealing at low compression (30%), and must meet the water sealability requirements of this document. Materials in this class are closed cell materials.

1.1.3 Class III A through E: Expanded rubber and rubber-like materials to be used for water sealing, but at greater compression than Class II materials, and must meet the water sealability requirements of this document. Materials in this class can be open cell, semi-open cell, semi-closed cell, or closed cell materials.

- a. **Class IIIA:** Meets water sealability at 40% compression.
- b. **Class IIIB:** Meets water sealability at 50% compression.
- c. **Class IIIC:** Meets water sealability at 60% compression.
- d. **Class IIID:** Meets water sealability at 70% compression.
- e. **Class IIIE:** Meets water sealability at 80% compression.

1.1.4 Class IV: Expanded rubber and rubber-like materials to be used for lighting applications, and must meet the lighting requirements of this document. Materials approved to Class IV must be sulfur-free. Materials in this class shall be closed cell materials. These materials shall meet water sealability at 40% compression.

1.1.5 Per Table 1 below, Class specific approved materials can be used in applications where there are lesser water sealability requirements. For example, an application requires water sealability at 50% compression (Class IIIB); materials approved to Class II and Class IIIA are permitted to be used in this application.

Table 1: Required and Allowable Materials

Class Required By Application	Water Sealability Requirement	Classes Permissible for Use
Class I	--	Class I, Class II, Class IIIA-E
Class II	30%	Class II only
Class IIIA	40%	Class II, Class IIIA
Class IIIB	50%	Class II, Class IIIA-B
Class IIIC	60%	Class II, Class IIIA-C
Class IIID	70%	Class II, Class IIIA-D
Class IIIE	80%	Class II, Class IIIA-E
Class IV	40%	Class IV only (exclusive to lighting applications)

All materials approved to this specification shall be listed in in the GM Materials Approved Source List. After a material has been granted approval, the required testing for annual material certification shall be all properties listed in Table 3.

Materials are divided into several types, depending on the stiffness (compression deflection).

Materials covered in this specification are resistant to +70 °C continuous and +100 °C excursion. Depending on the base material of the sponge rubber, higher temperature resistance (up to +100 °C permanent) can be obtained. Temperature resistance shall be verified on each foam material, shall be part of the data submitted for approval, and must be specified on the drawing or math data file.

Note: This specification does not cover silicone foams, polyurethane foams, or polyolefin foams. These families of foams have individual GMW specifications. Contact GM Materials Engineering for the appropriate foam specification for these materials.

1.1.6 Material Type shall be identified according to the range of compression deflection. See Table 2.

Table 2: Material Types and Related Compression Deflection

Material Type	Compression Deflection
Type I	< 5.00 kPa
Type II	5.00 kPa to 21.00 kPa
Type III	21.01 kPa to 48.00 kPa
Type IV	48.01 kPa to 97.00 kPa
Type V	97.01 kPa to 172.00 kPa
Type VI	172.01 kPa to 276.00 kPa
Type VII	> 276.00 kPa

Note: Compression deflection classifications shall be based on the average nominal compression deflection value $\pm 10\%$.

1.1.7 Certain applications may require the use of an adhesive. If an adhesive (ADH) is required, an ADH suffix shall be added after the basic specification and type number (e.g., GMW17408 Class II Type II – ADH). If an adhesive is specified, the adhesive backed material shall meet the requirements of GMW16443. See Table 7.

1.1.8 Other interior parts may require a low friction coating (CO) to reduce friction between the seal and the substrate. When this coating is required, a CO suffix shall be added after the specification, class, and type numbers (e.g., GMW17408 Class II Type II – CO). See Table 8.

1.2 Symbols. Not applicable.

1.3 Applicability. Typical applications include: air and dust seals, water seals and gaskets, isolators and rattle protection, covers for gaps, and other suitable applications.

1.4 Remarks. To properly use this specification, the information in 1.4.1 through 1.4.4 must be added to the engineering drawing or math data file.

1.4.1 Specify polymer base material, e.g., Acrylonitrile Butadiene Copolymer (NBR), Ethylene Propylene Diene Terpolymer (EPDM), Polyvinyl Chloride (PVC), Polychloroprene/Styrene Butadiene Blend (CR/SBR), etc.

1.4.2 Indicate the ADH or CO suffix if an adhesive or low friction coating shall be used.

1.4.3 Identify application such as interior, exterior, underhood, or exterior lighting. Specific tests are required for each use (see Table 4, Table 5, and Table 6).

1.4.4 Specify surface appearance and dimensions using current requirements as agreed upon between engineering and the supplier.

2 References

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

2.1 External Standards/Specifications.

FMVSS 302	ISO 1431-1	ISO 3386-1	ISO 23529
ISO 188	ISO 1798	ISO 3865	SAE J1389
ISO 845	ISO 2781	ISO 6916-1	

2.2 GM Standards/Specifications.

GMW3059	GMW3235	GMW14650	GMW16853
GMW3205	GMW3286	GMW14685	GMW17650
GMW3208	GMW14162	GMW14829	
GMW3221	GMW14270	GMW15634	
GMW3232	GMW14444	GMW16443	

2.3 Additional References.

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3 Requirements

3.1 Requirements on Test Specimens. Unless otherwise specified, the shape, size, and number of test pieces shall be in accordance with the relevant test procedures. Specimen conditioning shall be as specified in the relevant test methods. The minimum time between manufacturing and testing shall be 72 h.

3.1.1 Unless otherwise stated, ambient temperature test conditions shall be held to $+23\text{ °C} \pm 5\text{ °C}$; all other temperatures shall be held to $\pm 3\text{ °C}$. Unless otherwise stated, mechanical properties in delivery state and after heat or fluid immersion, are to be tested at $+23\text{ °C} \pm 5\text{ °C}$ and with the same test procedures.

3.2 Emissions Testing of Interior Materials and Parts. For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

3.3 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

3.4 Shelf Life. The material shall be packed to prevent permanent deformation when shipped or stored. It must meet all requirements of this specification after six (6) months storage at $+50\text{ °C}$.

3.5 Material and Performance Requirements. Material requirements are summarized in Table 3 through Table 6. All materials are required to test a minimum of six (6) lots to Table 3 requirements, with the exception of Water Impermeability (1 lot only). Table 4 through Table 6 require one (1) lot of test data only.

3.6 Test Results. With reference to this standard, the test results shall be presented in a test report.

Table 3: Material Properties for All Applications (6 lots)

Property	Test Method	Unit	Value
Density			
All Classes and Types	ISO 2781 or ISO 845	g/cm ³ kg/m ³	To Be Reported
Compression Deflection			
All Classes, Type I	ISO 3386-1 Values shall be determined after one (1) minute of a single 50% compression on unplied material (no preflex) after being compressed at a rate of 50 mm/minute Samples shall be 50 mm × 50 mm with a minimum sample thickness of 3.2 mm. All adhesive surfaces shall be dusted with talc to prevent adhesion to the compression plates. Additionally, compression deflection curves from 0% to 90% compression shall be submitted for each product prior to approval.	kPa	< 5.00
All Classes, Type II		kPa	5.00 to 21.00
All Classes, Type III		kPa	21.01 to 48.00
All Classes, Type IV		kPa	48.01 to 97.00
All Classes, Type V		kPa	97.01 to 172.00
All Classes, Type VI		kPa	172.01 to 276.00
All Classes, Type VII		kPa	> 276.00
Compressibility (value to be measured on finished part only) ^{Note 1}			
All Types and Classes	GMW14685-1C3	N/cm ²	Report Value
Water Absorption			
All Classes, Type II, Type III and Type IV	ISO 6916-1, Annex E Samples shall be 50 mm × 50 mm × 12.5 mm, or the thickest material produced Report thickness deviating from 12.5 mm	% by mass	10 Maximum
All Classes, Type V, Type VI and Type VII		% by mass	5 Maximum
Tensile Strength			
All Classes, Type I	ISO 1798, Type 1 Die	kPa	50 Minimum
All Classes, Type II and Type III		kPa	172 Minimum
All Classes, Type IV		kPa	275 Minimum
All Classes, Type V, Type VI and Type VII		kPa	379 Minimum
Elongation			
All Classes and Types	ISO 1798, Type 1 Die	%	100 Minimum
Age Resistance ^{Note 2}			
All Classes and Types	ISO 188 Method B, 168 h +0 h/-2 h at +70 °C ± 3 °C Change of compression deflection	%	± 30 Maximum
Cold Resistance			
All Classes and Types	Condition per ISO 23529, -30 °C ± 3 °C; 4 h +0 h/-0.5 h, then bend in cold condition 180 degrees around mandrel with radius of two (2) times the sample thickness Visual Examination		No cracks