Fundamentals of Protection Elastomers (PVC)

TYPE

What is it: The physical molecular structure of a elastomer material defines its “type”

Importance: Inherent physical material properties = PERFORMANCE

COLOR

What is it: Color of the elastomer core

Importance: If visible, aesthetics can be important; elastomer color matches to adjacent surfaces

GAUGE

What is it: The gauges indicated are those offered today and are expressed in inches (mm)

Importance: Most projects have a predefined joint/gap due to design specifics:

- Thicker Foams: Fill larger gaps and can accommodate nonparallel surfaces.
- Thinner Foams are for smaller gaps and less expensive

MATERIAL STIFFNESS

What is it: General Reference to categorize the “Softness/Hardness/Stiffness” of our materials

Importance: Indicative of 4 CRITICAL material properties (discussed below):
Density, Force to Compress, Compression Deflection & Hardness

MATERIAL STIFFNESS: DENSITY

What is it: Measurement of Mass lb./ft^3 (kg/m^3)

Importance: A relative indication of firmness & weight

Industry Standard: ASTM D3574 or ASTM D1667

MATERIAL STIFFNESS: COMPRESSION DEFLECTION (CFD)

What is it: Force to deflect (push back) after one minute when compressed to thickness of 30% of original height:

- 3 = ≥ 2.8 psi
- 2.5 = 1.9–2.7 psi
- 2 = 1.1–1.8 psi
- 1.5 = 0.5–1.0 psi
- 1 = < 0.4 psi

Importance: This is an indication of its resiliency or cushioning capability, as well as the ability to provide a seal (water/air). Softer foams have low force, firm foams have higher forces.

Industry Standard: ASTM D3574 or ASTM D1667

MATERIAL STIFFNESS: FORCE TO COMPRESS (FTC)

What is it: Initial force required to compress the elastomer 30% of its original height:

- 3 = ≥ 5 psi
- 2.5 = 3–4.9 psi
- 2 = 2–2.9 psi
- 1.5 = 1.7–1.9 psi
- 1 = <1.6

Importance: Indication of the ease or difficulty to compress the foam. Softer foams have low force, Firm foams have higher forces.

Industry Standard: ASTM D3574 or ASTM D1667

MATERIAL STIFFNESS: HARDNESS

What is it: Defined as a material’s resistance to permanent indentation. A variety of spring gauge devices are used for measurements. PVC elastomer utilize Shore 00 scale.

Importance: It is an easy technique and ideal for solids. Values generated for cellular elastomers is a relative indication & not as precise as FTC/CFD.

Industry Standard: ASTM D2240

STRENGTH — TENSILE STRENGTH

What is it: Amount of force required to stretch the core elastomer until it breaks, typically shown in units of psi (kPa)

Importance: Provides an understanding of the toughness &/or robustness of the core elastomer

Industry Standard: ASTM D3574, ASTM D412 die A

STRENGTH — ELONGATION @ BREAK

What is it: Amount the core elastomer is able to stretch prior to breaking, measured as %

Importance: Provides an understanding of the core elastomer ability to stretch

Industry Standard: ASTM D3574, ASTM D412 die A

FATIGUE RESISTANCE — COMPRESSION SET RESISTANCE

What is it: Amount the elastomer recovers to its original height after being compressed 50% for 24 hr period (sample conditioned under ambient conditions 70°F (21°C).

Importance: Provides a reference to the elastomer’s resiliency and ability to seal. Lower value is more desirable.

Industry Standard Test: ASTM D3574 or ASTM D1667

WATER SEAL — WATER ABSORPTION

What is it: Amount of water absorbed by the elastomer as a % change by volume when submerged at 2″ depth

Importance: Provides an indication of its ability to water seal (cell structure may also have an influence)

Industry Standard Test: ASTM D1056, NTP 35, AMS 3568-b

WATER SEAL — U-SEAL TEST

What is it: Laboratory simulation of a water seal of the elastomer at 2″ water height

Importance: Simulates water seal gasket at low pressure

Industry Standard Test: NTP38

WATER SEAL — INGRESS IPX7

What is it: Laboratory simulation of a water seal following a more severe conditions:

- 3 = 1 Meter @ 25% compression
- 2.5 = 0.6M @ 25% compression
- 2 = 0.6M @ 50% compression
- 1.5 = 0.15M @ 50% compression
- 1 = 0.15M @ 75% compression

Importance: Simulates water seal gasket for modest pressure. Common enclosure ratings (example battery pack assembly or electronic enclosures).

Industry Standard Test: IPX7 reference

TEMPERATURE SERVICE RANGE

What is it: Temperature range in which the elastomer would undergo limited performance variations under load and in which thermal degradation is negligible

Importance: Need to ensure the elastomer performs for the expected application temperatures

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*Strong Feature	Market	IND/CONST	IND/CONST	IND/CONST	IND/CONST	IND/CONST	IND/CONST	IND/CONST	IND/CONST	AUTO	AUTO	AUTO	AUTO	AUTO	CONST	TRANSP	IND/CONST	IND/CONST/ AUTO	IND/CONST	IND/CONST/AUTO
		Standard Products								Auto Focused Products					Specialty Products					
	Adhesive Type	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (aqueous)	Acrylic (solvent)	Optional Supported Acrylic	Optional Supported Acrylic	Optional Supported Acrylic
	Standard Liner	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Paper — WH	Permanent PET	Paper — WH	Paper/Poly	Paper — WH	Paper — WH	Paper — WH
What	**Legend**	**V820**	**V730**	**V770**	**V710**	**V740**	**V780**	**V760**	**V860**	**LA Foam**	**L Foam**	**A Foam**	**B Foam**	**C Foam**	**CST V494**	**V620**	**V980/V990**	**Extrusion PVC**	**Extrusion PVC NSF**	**Extrusion TPE**
"Snapshot" Summary		*Our softest & thickest black PVC foam*	*Our softest gray grade*	*Slightly firmer grade of V820, very popular*	*Designed specifically for use with fasteners/ screws*	*Multi-purpose, value priced*	*Enhanced version of V740 improved weathering & flame resistance properties*	*Good water seal at firm grade*	*Best water seal firm grade with flame resistance*	*Our softest grade, auto OEM approved*	*Very soft grade, auto OEM approved, very popular*	*Soft grade, auto OEM approved, very popular*	*Medium grade, UV resistance, auto OEM approved*	*Firm grade, auto OEM approved*	*Designed specifically for floor joist damping*	*Designed for high elongation; "stretching around corners"*	*Double-sided PSA tape for window glazing*	*Made-to-order, medium to firm grade extruded profiles*	*Made-to-order, medium grade extruded profiles approved for use in food zone areas*	*Made-to-order, medium to firm extruded profiles to accommodate open & close joints and elevated temperatures*
TYPE	The physical molecular structure of a elastomer material defines its "type"	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	PVC	TPE
COLOR	Color of the elastomer core	Black	Gray	Black	Gray	Black & Gray	Black	Gray	Black	Black	Black	Black	Black	Black	Green	Gray	Black, Gray or White	Black, Gray or White	Black, Gray or White	Black
GAUGE	The gauges indicated are those offered today and are expressed in inches (mm)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7) 0.625" (16) 0.75" (19.1) 0.87" (22.4)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7) 0.625" (16) 0.75" (19.1)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7) 0.625" (16)	0.062" (1.6) 0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5)	0.062" (1.6) 0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5)	0.062" (1.6) 0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5)	0.062"(1.6) 0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7) 0.625" (16) 0.75" (19.1)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7) 0.625" (16) 0.75" (19.1) 0.87" (22.4)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7) 0.625" (16)	0.062" (1.6) 0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5)	0.125" (3.2) 0.188" (4.8) 0.25" (6.4) 0.375" (9.5) 0.5" (12.7)	0.125" (3.2)	0.062" (1.6) 0.094" (2.4)	0.032" (0.8) 0.062" (1.6) 0.125" (3.2) 0.188" (4.8) 0.25" (6.4)	0.188"–0.5" (varies)	0.188"–0.5" (varies)	0.188"–0.5" (varies)
MATERIAL STIFFNESS	General Reference to categorize the "Softness/Hardness/Stiffness" of our materials	Very Soft	Soft	Soft	Medium	Medium	Medium	Firm	Firm	Ultra Soft	Very Soft	Soft	Medium	Firm	Medium	Medium	Firm	Medium	Medium	Medium
MATERIAL STIFFNESS: DENSITY	Measurement of Mass lb./ft³ (kg/m³)	6 (96)	6 (96)	6 (96)	10 (160)	9 (144)	9 (144)	15 (240)	15 (240)	6 (96)	6 (96)	6 (96)	9 (144)	15 (240)	9 (144)	10 (160)	15 (240)	7–14 (112–224)	9.5 (150)	15 (250)
MATERIAL STIFFNESS: COMPRESSION DEFLECTION (CFD)	Force to deflect (push back) after one minute when compressed to thickness of 30% of original height: 3 = ≥ 2.8 psi 2.5 = 1.9–2.7 psi 2 = 1.1–1.8 psi 1.5 = 0.5–1.0 psi 1 = < 0.4 psi	1.5	2	2	2.5	2.5	2.5	3	3+	1	1.5	2	2.5	3+	2.5	3	3	1.5–3	2.5	3
MATERIAL STIFFNESS: FORCE TO COMPRESS (FTC)	Initial force required to compress the elastomer 30% of its original height: 3 = ≥ 5 psi 2.5 = 3–4.9 psi 2 = 2–2.9 psi 1.5 = 1.7–1.9 psi 1 = <1.6	1.5	2	2	2.5	2.5	2.5	3	3+	1	1.5	2	2.5	3	2.5	3	3	2–3	2.5	3
MATERIAL STIFFNESS: HARDNESS	Defined as a material's resistance to permanent indentation. A variety of spring gauge devices are used for measurements. PVC elastomer utilize Shore 00 scale	10	13	13	32	28	28	45	55	8	10	13	28	55	28	48	60	30–60	35	40
STRENGTH — TENSILE STRENGTH	Amount of force required to stretch the core elastomer until it breaks, typically shown in units of psi (kPa)	14 (94)	15 (130)	35 (241)	35 (241)	40 (276)	49 (338)	55 (379)	115 (790)	12 (88)	14 (94)	35 (241)	49 (338)	115 (790)	N/A	67 (462)	60 (414)	N/A (Supported PSA)	N/A (Supported PSA)	N/A (Supported PSA)
STRENGTH — ELONGATION @ BREAK	Amount the core elastomer is able to stretch prior to breaking, measured as %	125%	140%	80%	80%	100%	130%	140%	160%	100%	125%	80%	130%	160%	N/A	144%	180%	N/A (Supported PSA)	N/A (Supported PSA)	N/A (Supported PSA)
FATIGUE RESISTANCE — COMPRESSION SET RESISTANCE	Amount the elastomer recovers to its original height after being compressed 50% for 24 hr period (sample conditioned under ambient conditions 70°F (21°C)	4%	7%	7%	9%	8%	5%	4%	5%	4%	4%	7%	5%	5%	8%	5%	5%	2%	2%	2%
WATER SEAL — WATER ABSORPTION	Amount of water absorbed by the elastomer as a % change by volume when submerged at 2" depth	5%	4%	4%	5%	2.50%	2.50%	3%	2%	6%	5%	4%	2.5%	2%	2.5%	2%	1%	15%	15%	15%
WATER SEAL — WATER — U-SEAL TEST	Laboratory simulation of a water seal of the elastomer at 2" water height	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	N/A	Pass	Pass	Pass	Pass	Pass
WATER SEAL — INGRESS IPX7	Laboratory simulation of a water seal following a more severe conditions: 3 = 1 Meter @ 25% compression 2.5 = 0.6M @ 25% compression 2 = 0.6M @ 50% compression 1.5 = 0.15M @ 50% compression 1 = 0.15M @ 75% compression	1	1	1	1	1.5	2	2.5	3	1	1	1	2	3	N/A	1.5	3	1	1	1
TEMPERATURE SERVICE RANGE	Temperature range in which the elastomer would undergo limited performance variations under load and in which thermal degradation is negligible	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-30–180F (-30–82C)	-15–160F (-26–71C)	-15–160F (-26–71C)	-15–180F (-26–82C)
Other Unique Attributes		Thickest gauge at 0.87" (22.4); flame resistance		Flame resistance	"Swirl free", will not twist or displace when penetrated	Value Priced	Additional UV and flame resistance	Good water seal	Best water seal	Softest water sealing foam, OEM approved	OEM approved	OEM approved	Good UV resistance, OEM approved	OEM approved	Flame smoke resistance to ASTM E-84	High elongation	AAMA approved, Temporary mounting during assembly; superior water seal	Long length spools for productivity enhancement	Long length spools for productivity enhancement; NSF food zone approved	Long length spools for productivity enhancement; suitable for open and close joints and application temperatures up to 180°F