Fundamentals of Protection Elastomers (PVC)

**TYPE**
What is it: The physical molecular structure of an 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: The physical molecular structure of a material defines its “type”
- Hardness: A relative indication of firmness & weight
- Compression Deflection & Hardness
- Force to Compress

**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: DENSITY**
What is it: Measurement of Mass lb./ft³ (kg/m³)
Importance: A relative indication of firmness & weight
Industry Standard: ASTM D3574 or ASTM D1667

**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’s ability to stretch
Industry Standard: ASTM D3574, ASTM D412 die A

**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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**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: ASTM D3574 or ASTM D1667

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### Other Unique Attributes
- **Thickened gauge of 0.067” (2.2 mm)**: Flare resistance
- **Flame resistance**: Flame retardant
- **Soft seal Not test for wrap when damaged**: Value Pricing
- **Additional UV and flame resistance**: Good water seal
- **Best water seal**
- **Softest water seal, OEM approved**: Good UV resistance
- **OEM approved**: Flame retardance
- **Fire resistance**: ASTM E-84
- **High elongation**: Made-to-order
- **Resistance to abuse and use**: Made-to-order
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| Legend       | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PVC | PV