



Sealing Essentials

Every sealing application is different. Published specifications provide a standardized way to talk about rubber, but choosing the right seal begins with understanding what you need. This e-book from Elasto Proxy is designed to help guide you through this process.

For over 20 years, our family-owned company has provided high-value, low-volume sealing solutions to a variety of industries. Our name, a combination of the words “elastomer” and “proxy”, represents our commitment to fully understanding your needs and delivering on them.

Sealing challenges can be complex, and no two applications are the same. Choosing the right rubber is important, but you’ll need to consider seal geometry and vendor capabilities, too. This e-book provides a sound overview, with links to where you can find even more information.



Compound Selection

The consequences of choosing the wrong rubber can be expensive. Elastomers have specific properties, and a rubber that’s right for an interior door seal may not be able to withstand weathering or ultraviolet (UV) light. At the same time, door seals for outdoor environments can’t withstand certain chemicals.

Material costs matter, too. Although each sealing application has its own requirements, cost control is a standard part of supply chain strength. So why pay more for silicone if a less expensive rubber can meet all of your requirements?

When it comes to [compound selection](#) then, you’ll need to consider factors such as:

- Industry standards and applications
- Temperature and pressure
- Chemical resistance

- Hardness
- Other material properties

The following sections explain in detail.

Industry Standards and Applications



Do you need to consider industry standards or approvals during your seal selection process? For example, suppliers to the automotive industry adhere to [ASTM D 2000](#). For their part, mobile specialty vehicle manufacturers follow safety requirements for rollover protection structures (ROPS).

Does your product application involve fire-rated materials for electronics enclosures? If so, review the flammability requirements in UL-94 or V-L. Do you serve the mass transit industry instead? Then check Bombardier SMP 800-C and fire, smoke, and toxicity (FST) requirements.

Other industries also adhere to published specifications. For example, both the U.S. Food and Drug Administration (FDA) and National Sanitary Foundation (NSF) define standards for food and medical equipment manufacturers. Even the makers of hockey helmets follow [safety standards](#).

Temperature and Pressure



What are the temperature requirements for your sealing application? Specifically, what is the [service temperature](#), or the minimum and maximum temperatures, at which the seal must operate? Silicone rubber can withstand very low and very high temperatures, but could a [less expensive compound](#) like neoprene meet your application's temperature requirements?

In addition to service temperature, you'll need to think about [thermal expansion](#). When a seal is heated or cooled, its length changes according to a numeric value called the coefficient of linear expansion. So if you're trying to seal an exterior door against extreme cold, choose a compound that won't shrink, create a gap, and admit winter wind and snow.

Temperature isn't the only environmental parameter to consider, however. What are the pressure requirements of your sealing application? Do you need a rubber material with a low tensile strength or a high tensile strength then? To fully understand the sealing environment, you'll need to consider the presence or absence of chemicals, too.

Chemical Resistance



Rubber gaskets that encounter oils or come into contact with chemicals are subject to different environmental conditions than door seals, window channels, or anti-vibration mats. If you need a sealing solution that provides chemical resistance, it's important to identify which chemicals the seal must withstand.

For example, will your seal come in contact with process chemicals or cleaning agents? How about heating oils, hydrocarbons, or animal and vegetable fats? Ask your supplier for information about a rubber's resistance to specific chemicals, or even to categories of chemicals. Then use this information when evaluating your options and selecting seals.

Hardness



Hardness as measured in durometers or duro is another important factor to consider when it comes to compound selection. Do you need solid profiles or sponge profiles for your application? Let's review your options.

Solid rubber profiles are harder and most resistant to compression than sponge profiles. Solid profiles of all duro levels can be molded into various shapes and sizes.

Sponge profiles can also be shaped, and are usually characterized as soft, medium, and firm.

Not all solid profiles are the same, however. At 40 duro, solid profiles have the consistency of pencil erasers. At 90 duro, they are hard like hockey pucks. Based on your application, do you need a rubber seal that's better suited for a classroom or a hockey rink? What durometer range do you need?

Other Material Properties



Industry standards offer a standard, shorthand way to describe the properties of rubber compounds. Temperature resistance, chemical resistance, and hardness are just some of the properties you'll need to consider, however.

Other [comparative properties](#) include specific gravity, adhesion to metal or fabrics, tear resistance, abrasion resistance, compression set, and rebound. Based on your application, you may also need to consider dielectric strength, electrical insulation, permeability to gases, and acid or solvent resistance.

Unless you're a chemist, a materials engineer, or an experienced technical buyer, some of these comparative properties may sound exotic or unfamiliar. That's where a good [rubber dictionary](#) comes in handy. A phone call or email to a supply chain partner can help, too.

II. Seal Geometry



To ensure proper sealing, the force that's required to displace a profile depends on a combination of factors, including material type and hardness. Compound selection can help you to select a rubber that can resist high temperatures and chemicals, but what about the seal's shape?

Seal Shape, Seal Hardness, and Compression

Both seal shape and seal hardness play a role in resistance to compression. That's why seal geometry is so important. O-Rings are relatively simple, but profile gaskets are much more complex. Where does your application fall on this spectrum?

How will a rubber part react to a clamping force or to any other kind of pressure, including from elements such as wind and water? Both part shape and compression deflection play a role.

Bending Radius, Gap Variation, and Safety Factor

Does your seal need to bend on multiple planes? If so, consider the bending radius. Don't forget the gap variation and the safety factor either. Ignoring them can affect your product designs and limit available options.

Although many seal designers use CAD software, what looks good on a computer screen (or on paper) may not be right in the real-world. Simply put, some seal designs don't consider the realities of the manufacturing process.

For example, consider the case of a custom fabricator that must band the press and then assemble a rubber part. Your simulation software may show a 1/4" gap, but the reality is more like 3/8". If your design included a suitable safety factor, then this discrepancy still leaves room for the seal.

Don't ignore the importance of sealing during the product design phase. Start with the seal design and avoid ending up with problems later on. If you design all of the metal and forget to leave room for the rubber, your options may be limited until the next equipment redesign.

Vendor Selection



Vendor selection isn't just about choosing the right seal. It's also about supply chain strength. How do you evaluate a potential vendor's capabilities then? For starters, send them a seal from the field. Let the vendor see what the seal looks like, what it's been exposed to, and any damage that's been done.

Samples and Replacement Parts

After asking the vendor to evaluate your seal's shape and condition, request a sample and an estimated time-of-arrival. Are the samples you receive appropriate for your application? Are you able to validate them? Did they arrive on-time and as promised?

Questions and Answers

A supply chain partner can learn a lot by evaluating a seal's shape and condition, but they need to ask plenty of questions, too. Does the potential vendor listen to all of your requirements and analyze all of your needs? Do their questions indicate that they have technical expertise and application knowledge?

Certifications and Manufacturing Capabilities

Do you want a supplier that's ISO certified? Do you need a partner with a Controlled Goods Certificate (CGC) so that you meet the requirements of the Canadian defense industry? Certifications may vary by country and application, so know what you need when comparing vendors.

Vendors differ in terms of custom fabrication capabilities, too. Do you need water jet cutting, splicing, taping, die cutting, cold bonding, vulcanizing, or molding? Seal selection is a complex process, so it's important to understand all of your requirements – from compound selection, to seal geometry, to vendor selection.