Selecting Caulk

BY BILL ROBINSON

We have come a long way from tar and oakum for patching leaks. Now there are caulks and sealants with chemistry that makes them stick to other materials, stretch to as much as 100% of the installed width, and last more than just a couple of years. That said, I advise thinking of caulk joints as temporary at best. They will always need periodic inspection. Even if they last many years, the service life of even a high-quality caulk is significantly shorter than the service life of the materials they are sealing.

There are a wide range of chemistries used in caulks, adhesives, and sealants. This article covers the ones I have found to be the most common in residential and light-commercial construction. We in the residential construction industry have not kept up well with the advances in chemistry, and while I try to stay informed on this topic, I am aware that the landscape is constantly changing.

In particular, it is time to adjust to the 21st century of high-performing caulks and sealants by getting into the habit of checking the manufacturers' tech sheets. I work with five different types of caulk—water-based, solvent-based, polyurethane, silicone, and modified polymers. This last category mostly includes silane modified polymers and other chemical hybrids that have emerged in the last decade; they are typically proprietary formulations but have some common characteristics that allow us to group them together. Each of these types has a purpose, and rather than looking for a one-size-fits-all caulk, I suggest you identify the things you use caulk for, select the appropriate caulk for each use, and then make sure it is used as intended.

Water-based caulks typically clean up with water and cure on evaporation. Anything that cures on evaporation will shrink. Most water-based caulks are 40% to 60% solids (with some exceptions). When the caulk cures, it shrinks to the percentage of solids in the mix. Sometimes it is difficult to tell from the label what the chemistry is, but a clear "tell" of a water-based caulk is a warning on the tube to keep it from freezing. Another is marketing language that says something like "easy water cleanup." Be aware that an acrylic or latex caulk that has been "siliconized" is still a water-based caulk that will shrink. I would not use such caulk on the exterior of a building. I like water-based caulks for covering up joints in trim on the interior. For anything else, I steer clear of them.

Solvent-based caulks. The solvent is typically mineral spirits and, similar to a water-based caulk, a solvent-based caulk cures on evaporation of the solvent. That means it will shrink, though typically a little less than water-based formulations.

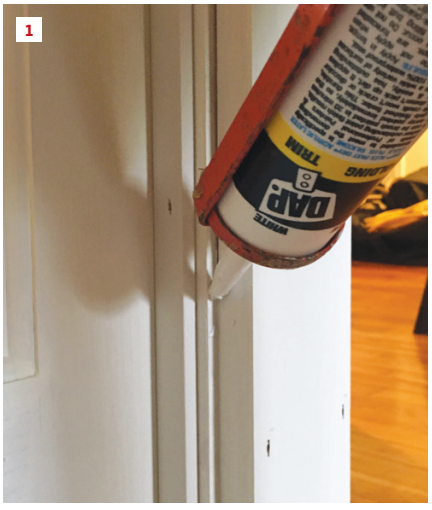
Solvent-based caulks are typically 60% to 80% solids and will shrink to 60% to 80% of their original dimension. They are typically very sticky and therefore adhere well to substrates. In official terms, they typically have good *cohesion* (meaning the material sticks well to itself) and *adhesion* (meaning it sticks well to a properly prepared substrate).

The primary consideration for a solvent-based caulk is that the curing process will off-gas some solvent material, which means high VOCs and a short-term hazard to indoor air quality. I steer clear of them for interior use, but these caulks are very good outside and typically come in several colors. I like to use them when I need a color-matched caulk for siding.

Polyurethane caulks cure on exposure to the moisture in the air. Since they do not cure by evaporation like water- and solvent-based caulks, they do not shrink when they cure. They are nearly 100% solids—you get what you squeeze out of the tube. Based on what I hear from a wide range of exterior contractors, polyurethanes are typically the preferred caulk for exterior use. The downside of polyurethanes is they do not stand up well to UV light and have to be replaced after a few years of exposure to the sun.

Silicone caulks. I am talking about pure silicone sealant, not a "siliconized" formulation. Pure silicone is a nearly 100% solids material that cures on exposure to the moisture in the air. It does not "dry," and that means it does not shrink. Mistakenly, many people believe silicone is the go-to sealant for *all* applications and make a lot of assumptions about what silicone caulk can do.

Photo: Ted Cushman



Acrylic caulks, even ones "with silicone," will shrink when they cure, and are best suited for interior uses **(1)**. A true silicone doesn't shrink much and works best for sealing nonporous materials, such as glass and tile **(2)**; it's often a good choice for wet-area applications. For exterior applications, the author prefers advanced polymers, such as this one from Henry Company **(3)**.

Not all formulations are equal. There are two basic types of silicone caulk—acetoxy and oxime. The acetoxy formulation is what you will usually find on the shelves at lumberyards and big box stores. These caulks release acetic acid when curing, giving off a vinegar smell that can be an irritant to some people. Clear, 100% acetoxy formulations are unpaintable; the paint does not adhere to them and separates from the caulk. The biggest problem with acetoxy silicones, though, is they can cause corrosion of some materials. This was a bigger problem in the past, when silicone sealant technology was new and there was too much "free acid" in a lot of formulations. But even now, with mature product lines, adhesion and corrosion can be problems on acrylic, PVC, ABS, galvanized steel, and brass, depending on the product line.

Oxime formulations are "neutral cure"—meaning they release pH-neutral substances that are noncorrosive—and are specified by many material manufacturers to avoid the possibility of corrosion.

Silicones bond well to nonporous substrates like tile, glass, and most metals but don't work as well on porous materials like stone, masonry, and unpainted wood. They work well for wet areas, like baths and kitchens. I also use neutral-cure silicone to apply silicone bulb as weatherstripping on door astragals. In commercial applications, silicone is the go-to product for structural glazing.

Advanced polymers include caulks labeled MS (modified silicone) polymer, STPE (silyl terminated polyether), or a "hybrid." They are nearly 100% solids—so they do not shrink—they cure on exposure to moisture in the air, and they have great adhesion, cohesion, expansion, and durability. Many of the newer liquid flashing products fit into this category.

These are my preferred caulks for almost all exterior applications: They are usually easy to work with because they are typically more viscous (thicker), but you need to use a good caulk gun that has a higher thrust ratio (meaning the plunger moves a short distance for each full pump of the trigger). Some tend to skin over quickly, a property that is useful to me when I work in a light rain, because I don't need to worry about the caulk diluting before it cures. Since we are covering a wide range of sealant materials in this category, it is wise to confirm in the tech sheets available on the manufacturer's website that the sealant has the particular properties you want. (If the manufacturer is being cagey about revealing the material, check the MSDS, where manufacturers have to identify the ingredients.)

The organization of caulk types in this article is based on my experience. In particular, several years ago I worked on an EIFS (exterior insulation and finish system) project in California. After beginning the project, we learned that the window manufacturer would not warranty its product when installed with residential EIFS. But we were already underway: The windows had been purchased and we had to make it work. To learn more about EIFS applications, I met with a waterproofer who was well-versed in commercial work, especially EIFS installations, and it was an amazing "aha" moment for me when he said he was not familiar with water- or solvent-based caulks in his usual work. This surprised me, because in our residential world, for the most part, contractors favor a certain water- or solvent-based caulk, either because of the easy cleanup (for water-based) or for the variety of colors (for solvent-based). At the waterproofer's suggestion, we selected a neutral-cure silicone for our EIFS project, and we were able to get a warranty from the window manufacturer once we disclosed our application details.

That job put me on a track to learn more about caulks and sealants (as well as adhesives and tapes—other everyday products in our world of construction for which some understanding of chemistry is helpful). In particular, that job gave me an appreciation for how important the right sealant is for each job. Different product

Photos: 1, Ola DeKorne; 2, Adobe Stock; 3, Gene Summy

SELECTING CAULK

Type	Cure	Solids	Suggested use	Certification
Water-based	Evap.	40–60%	Interior trim	ASTM C834 - 17 Standard Specification for Latex Sealants
Solvent-based	Evap.	60–80%	Exterior siding, trim	ASTM C-920
Polyurethane	Moisture	~100%	Exterior (but protect from UV)	ASTM C-920
Silicone	Moisture	~100%	Wet areas, nonporous materials	ASTM C-920
MS polymers	Moisture	~100%	All exterior work	ASTM C-920

The ASTM certifications are an easy specification to look for on the label. The author suggests that any product that has *not* gone through the testing and certification process may not be the best choice for quality work.

manufacturers can be picky about what they will and won't accept. In the commercial construction world, this is much more controlled. In residential work, there are fewer controls and a lot of assumptions are made. It's worth pushing for tighter specs on the sealants you use. Don't just grab any caulk off the shelf if you are concerned for performance and longer durability. As a general rule, on any exterior, weather-sensitive application, we should be using high-solids-content caulks with good adhesion and cohesion. It's also important to define the properties you want, as the brands and the chemical formulations change over time.

I've discussed my preferred caulks here, but you might have your own preferences or know of brands I have not used. Once you find what works, of course, share what you learn with your crew and trade partners, provide them training, and above all, push them to use best practices for installing caulks and sealants (which is the subject of a different article).

Bill Robinson is a New Orleans–based contractor who focuses on solving building envelope and hot/humid-climate performance issues. He is a frequent presenter at JLC Live. Follow him on Instagram: @bandannabil.