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Standard Guide for Use in Selection of Liquid-Applied Sealants[1]

This standard is issued under the fixed designation C 1299; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers general background information for the comparative evaluation and selection of liquid-applied sealants for use in building construction.

1.2 The information contained herein has been submitted by ASTM Committee C-24 members but not verified independently by them.

1.3 This guide is not intended for use as a specification for sealants.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 The committee having jurisdiction for this specification is not aware of any similar ISO standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 510 Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants[2]
C 570 Specification for Oil- and Resin-Base Caulking Compound for Building Construction[2]
C 603 Test Method for Extrusion Rate and Application Life of Elastomeric Sealants[2]
C 639 Test Method for Rheological (Flow) Properties of Elastomeric Sealants[2]
C 661 Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer[2]
C 669 Specification for Glazing Compounds for Back Bedding and Face Glazing of Metal Sash[2]
C 679 Test Method for Tack-Free Time of Elastomeric Sealants[2]
C 711 Test Method for Low-Temperature Flexibility and Tenacity of One-Part, Elastomeric, Solvent-Release Type Sealants[2]
C 717 Terminology of Building Seals and Sealants[2]
C 718 Test Method for Ultraviolet (UV)-Cold Box Exposure of One-Part, Elastomeric, Solvent-Release Type Sealants[2]
C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)[2]
C 731 Test Method for Extrudability, After Package Aging, of Latex Sealants[2]
C 732 Test Method for Aging Effects of Artificial Weathering on Latex Sealing Compounds[2]
C 733 Test Method for Volume Shrinkage of Latex Sealing Compounds[2]
C 734 Test Method for Low-Temperature Flexibility of Latex Sealing Compounds After Artificial Weathering[2]
C 736 Test Method for Extension-Recovery and Adhesion of Latex Sealants[2]
C 792 Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants[2]
C 793 Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants[2]
C 794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants[2]
C 834 Specification for Latex Sealing Compounds[2]
C 920 Specification for Elastomeric Joint Sealants[2]
C 1085 Specification for Butyl Rubber-Based Solvent Release Sealants[2]
C 1183 Test Method for Extrusion Rate of Elastomeric Sealants[2]
C 1184 Specification for Structural Silicone Sealants[2]
C 1257 Test Method for Accelerated Weathering of Solvent Release-Type Sealants[2]
D 2203 Test Method for Staining from Sealants[2]
D 2377 Test Method for Tack-Free Time of Caulking Compounds and Sealants[2]
D 2452 Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds[2]
D 2453 Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds[2]

[1] This guide is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.10 on Specifications, Guides, and Practices.

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[2] *Annual Book of ASTM Standards*, Vol 04.07.

3. Terminology

3.1 *Definitions*—See Terminology C 717 for definitions of terms used in this guide.

3.2 *Definitions of Terms Specific to This Standard:* See Terminology C 717 for descriptions of terms used in this guide.

4. Significance and Use

4.1 This guide provides generally accepted comparative values of the characteristics and properties of the more common types of liquid-applied sealants.

4.2 Table 1 is a matrix of the characteristics and properties of liquid-applied sealants with applicable ASTM standards. Commercially available products within any one sealant type can vary considerably in several of the characteristics listed in Table 1. A range is provided where significant variation can be expected. The sealant user or specifier in these cases should obtain specific values from the manufacturer before making the final selection. The characteristic or property listed and its significance in sealant selection is as follows:

4.2.1 *Components*—The number of packaged components to be mixed together prior to application. Two-component sealants generally cure faster since the curing agent or catalyst is in one of the separate packages. Since one-component sealants do not require any mixing in the field, they are simpler to apply and preclude mixing inaccuracies, but the generally slower cure rate permits more movement to occur in the joint before the sealant achieves a final cure. Movement of the sealant prior to cure may affect the anticipated performance after cure. Two-component sealants generally cure faster than one-component sealants, but they require mixing in the field in accordance with the sealant manufacturer's instructions, and this must be conducted accurately to prevent improper curing of the sealant. An improper cure will affect the performance of the sealant.

4.2.2 *Chief Ingredients*—A list of the major polymer or ingredient from which the sealant derives its name, plus other accessory ingredients that affect the manufacture, cost, handling, application and performance of the sealant.

4.2.3 *Percent Solids*—The percentage of nonvolatile materials generally remaining in the sealant after application and cure. The retention of these materials is desirable, and any release as the sealant ages can affect performance. Volatile materials such as water, solvents, and some plasticizers are released after application, generally during the curing process. Their release will result in a volume and profile change of the applied sealant.

4.2.4 *Volume Shrinkage*—The volumetric proportions of volatile and nonvolatile components of a sealant. A sealant with excessive shrinkage may have a tendency to crack or shrink from the sides of the joint when in service. Applicable ASTM test methods for this property are Test Method C 733 for latex sealants and Test Method D 2453 for oil- or resin-base compounds. There is presently no universal test method suitable for comparing all sealant types. Both are therefore listed in Table 1, and the values should be judged accordingly.

4.2.5 *Curing Process*—The mechanism or chemical changes that the sealant undergoes in curing. Temperature, humidity, and joint configuration can have a significant effect on the cure rate of some sealants. This should be recognized in sealant selection since the conditions for a proper cure may not be available for the applied sealant.

4.2.6 *Curing Characteristics*—Some of the more significant characteristics that sealants develop during the curing process.

4.2.7 *Odor Level (During Cure)*—The odor level that may be expected during curing of the sealant. This is of particular importance when a sealant is being considered for use on an occupied building. There is presently no ASTM test method for this property. The odor does not necessarily persist after the sealant is cured, but this should be checked with the sealant manufacturer.

4.2.8 *Character After Cure*—The ability of a sealant to recover its original shape after extension or compression. Sealants are classified into four categories. "Elastic" describes a sealant that will change shape with an applied force and recover to its original shape after the force is released. "Plastic" describes a sealant that will change shape with an applied force and remain that way after the force is released. "Plasto-elastic" describes a sealant that will exhibit some recovery of its original shape after an applied force is released but is more like a plastic than an elastic sealant. "Elasto-plastic" describes a sealant that will show significant but not complete recovery of its original shape after an applied force is released and is more like an elastic than a plastic sealant. Elastic or elasto-plastic characteristics are important where relatively large amounts of movement occur repeatedly in a joint. See also 4.2.33.

4.2.9 *Service Temperature Range*—The suitable temperature range limits for the expected performance of the sealant. There is presently no ASTM test method for this property. The sealant manufacturer's recommendations should be followed. The extreme temperature limits given are based on occasional and temporary exposure.

4.2.10 *Hardness*—The hardness of a sealant determined in accordance with Test Method C 661. The results obtained by this test method are a measure of the indentation into the sealant material of the indentor under load. Hardness is not a measure of the abrasion or wear resistance of the sealant. They are described in Table 1 as to the general range of instantaneous durometer readings; the higher the number, the harder the sealant. Excessive hardening of a sealant as it ages is an undesirable characteristic. The sealants are classified according to their hardness after aging 1 to 6 months and at 5 years.

4.2.11 *Adhesion*—The ability of a sealant to adhere to common construction materials. Table 1 provides general adhesion characteristics. Test Method C 736 is the applicable test method for determining the adhesion loss for latex sealants, Test Methods C 711 and C 718 for solvent release sealants, and Test Method C 794 for single and multicomponent sealants. Test Method C 794 is used in Table 1 as the basis for comparison, and the values should be judged accordingly.

4.2.12 *Tack-Free Time*—The time period after application of the sealant during which the exposed surface of the sealant remains tacky. Dirt can become embedded in the surface of the sealant and affect its appearance during this time. Applicable test methods are Test Method C 679 for elastomeric sealants and Test Method D 2377 for caulking compounds and sealants. Test Method C 679 is used in Table 1 as the basis for comparison.

4.2.13 *Substrate Staining*—The potential staining of a sealant substrate and the color change of the sealant due to diffusion. Applicable test methods are Test Methods C 510 and D 2203. Test Method C 510 is for the testing of single or multicomponent sealants for the likelihood of a sealant causing early stain on a porous substrate due to chemical exudation from the sealant as well as potential color change of the sealant itself after weathering. Test Method D 2203 is more suitable for the testing of latex sealants. Test Method C 510 is used in Table 1 as the basis for comparison. The ratings given are general. Specific applications should be discussed with the sealant manufacturer.

4.2.14 *Dirt Pickup Resistance*—The ability of a cured sealant to resist the attraction and retention of dirt particles on its exposed surface that would affect its appearance by darkening it. There is presently no ASTM test method for this property.

4.2.15 *Mildew Resistance*—The ability of a sealant to resist mildew formation in mildew-causing environments such as high heat and moisture in unventilated areas. There is presently no ASTM test method for this property.

4.2.16 *Room-Temperature Flexibility*—The flexibility of a sealant at room temperature, which is generally considered the optimum for sealant performance. There is presently no ASTM test method for this property.

4.2.17 *Low-Temperature Flexibility*—The flexibility of a sealant in a low-temperature environment. Some sealants have a tendency to harden and become less flexible at lower temperatures, some can degrade below freezing temperatures, while others are relatively unaffected at temperatures considerably below freezing. Applicable test methods for this property are Test Method C 711 for solvent release sealants, Test Method C 718 for elastomeric sealants, and Test Method C 734 for latex sealants.

4.2.18 *Abrasion Resistance*—The vulnerability of a sealant to abrasion. This property is of particular importance when considering the use of a sealant in joints of traffic areas that will be subject to pedestrian and vehicular traffic. There is presently no ASTM test method for this property.

4.2.19 *Puncture and Shear Resistance*—A sealant's ability to resist puncture or shear forces. This property has particular importance when considering the use of sealants in joints of traffic areas that will be subject to pedestrian and vehicular traffic. There is presently no ASTM test method for this property.

4.2.20 *Shelf Life*—The period of time that sealants can be stored at manufacturer-specified conditions and still be suitable for their intended use. There is presently no ASTM test method for this property.

4.2.21 *Application Life*—The application life (sometimes called "pot life") of a sealant is determined in accordance with Test Method C 603. The results obtained by this test method are simply a measure of the time required to extrude a known volume of sealant through a standardized orifice under a predetermined pressure. This test method is not a measure of cure rate. It is generally indicative of the rapidity required for the application of a one-component sealant after the cartridge is opened and after a two-component sealant is mixed. The application life (time period) is affected by the climatic conditions to which they are exposed. The application life is qualitatively rated in Table 1 as poor to excellent. A poor rating would mean that specific care is needed during application, such as requiring a relatively quick application or possibly some heating of the material, as may be recommended by the manufacturer for some one-component sealants during colder weather. An excellent rating would indicate no unusual problems with the application life.

4.2.22 *Application Temperature Range*—The temperature range of the substrate during which time the sealant may be applied. The substrate temperature can be significantly different from the ambient temperature and should be recognized when installing sealants. The temperature limits as established by the sealant manufacturer should prevail for a reasonable time period after application of the sealant.

4.2.23 *Primer Use*—The purpose of a primer is to enhance the adhesion of a sealant to the substrate. It also serves as a diffusion retarder or barrier and dirt emulsifier. There are advantages to a sealant and substrate that do not require a primer since the necessity for additional work and the potential for improper application is eliminated. However, a primer of the type recommended by the manufacturer should be applied in accordance with the manufacturer's instructions where a primer is necessary or recommended by the sealant manufacturer for optimum or adequate adhesion, since adhesion of the sealant to the substrate is of critical importance.

4.2.24 *Freeze-Thaw and Heat Stability*—The extrudability of sealants after freeze-thaw and heat cycling. The applicable test method for latex sealants is Test Method C 731. Laboratory test results of this test method serve to indicate only the ease of application and do not predict the performance capability of the sealant after installation. They also measure the freeze-thaw and heat stability of such sealants. There is presently no available test method for this property for sealant types other than latex.

4.2.25 *Extrudability Resistance*—The resistance to extrusion of a sealant from an orifice, which is an aid in determining suitable application procedures. Applicable ASTM test methods are Test Methods C 603 and C 1183 for elastomeric sealants, Test Method C 731 for latex sealants, and Test Method D 2452 for oil- and resin-base caulking compounds. Test Method C 1183 is used as the basis for comparison in Table 1. The resistance is qualitatively rated from low to high.

4.2.26 *Sag Resistance*—The flow properties of sealants that have particular importance relative to placement in joints of vertical, sloped, and horizontal planes. Other relevant factors of importance are the width of joints and ambient temperatures during cure. The applicable ASTM test method is Test Method C 639 for single and multicomponent chemically curing sealants. Sealants are generally classified relative to this property as nonsag (or gunnable) self-leveling (or pourable).

4.2.27 *Toolability*—The period of time during which a sealant should be tooled before difficulties can develop, such as tooling a sealant that has already skinned over. Sealants for which toolability is not as time-related, such as the plastic and plasto-elastic types, are rated as to ease of achieving a smooth, properly configured surface. There is no ASTM test method for this property. Instructions for proper tooling should be determined by the sealant manufacturer.

4.2.28 *Paintability*—The ability of a sealant to be painted and to exhibit good adhesion on its outer surface by compatible paints or coatings. Paintability does not evaluate the performance of the paint or coating after application. For the coating to perform without crazing or cracking, it must be compatible with the anticipated movement of the sealant in the joint. There is presently no ASTM test method to determine this property. If applied too early, paint can also cause sealant failure by embrittling its surface or inhibiting its cure. Paintability is best determined by the sealant manufacturer for actual materials intended for use.

4.2.29 *Drying Time Before Painting*—The length of time before a compatible sealant is ready for painting. The drying time is dependent on the tack-free and full cure time as well as the cure temperature and humidity. There is presently no ASTM test method for this property. The determination is best made by the sealant manufacturer.

4.2.30 *Ultra-Violet Resistance*—The ability of a sealant to resist the degrading effects of exposure to ultraviolet rays, such as cracking. The effects on the sealant are determined by Test Methods C 718 and C 1257 for elastomeric solvent release sealants, Test Method C 734 for latex sealants, and Test Method C 793 for elastomeric joint sealants. There is presently no universal test method suitable for the comparison of all sealant types. All are therefore listed in Table 1, and the values should be judged accordingly. The resistance to degradation from exposure to ultraviolet rays is rated qualitatively in Table 1 from poor to excellent.

4.2.31 *Ozone Resistance*—The ability of a sealant to resist degradation, such as hardening and cracking, under exposure to ozone. There is presently no ASTM test method for this property. The resistance to degradation from ozone exposure is rated qualitatively in Table 1 from poor to excellent.

4.2.32 *Artificial Weathering and Heat Aging*—The effects of artificial weathering and heat aging on sealants as related to wash out, cracking, discoloration, and adhesion loss. The applicable ASTM test methods are Test Method C 732 for latex sealants, Test Methods C 718 and C 1257 for solvent release sealants, and Test Methods C 792 and C 793 for elastomeric sealants. There is presently no universal test method suitable for the comparison of all sealant types. All are therefore listed in Table 1, and the values should be judged accordingly. The ratings in Table 1 are qualitative.

4.2.33 *Extension and Recovery*—The ability of a sealant to recover its original shape after its extension and release. The applicable ASTM test method for latex sealants is Test Method C 736. Plastic and plasto-elastic sealants are rated qualitatively in Table 1, and elasto-plastic and elastic sealants are rated quantitatively according to the percentage of recovery of their original shape.

4.2.34 *Movement Capability*—The movement capability of a sealant in a joint after installation and after cure. They are rated in Table 1 according to the percentage of movement capability in extension (+) and compression (−). The applicable ASTM test method is Test Method C 719.

4.2.35 *Life Expectancy*—The durability and useful life of the sealant in a joint under ideal conditions with a joint seal that is designed and constructed properly. There is no individual test method for this property. Durability is affected by varying climatic conditions in service. Field conditions will typically reduce the potential service life.

TABLE 1 Matrix of Characteristics and Properties of Liquid-Applied Sealants

Characteristic or Property and ASTM Test Method			1 Components	2 Chief Ingredients	3 % Solids, by weight	4 Volume Shrinkage
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C 570	1	drying oils, plasticizers	85 to 95	less than 10 %
B	butyl (mastic)		1	butyl	70 to 90	less than 30 %
C	polyisobutylene		1	polyisobutylene	90, min	less than 20 %
D	butyl (solvent)	C 1085	1	butyl	75 to 85	less than 30 %
E	acrylic (solvent)		1	thermoplastic acrylic	65 to 87	15 to 30 %
F	acrylic (emulsion)	C 834	1	emulsion acrylic, fillers (except for clear)	60 to 85	40 to 50 % (clears) 20 to 30 % (pigmented)
G	PVA (emulsion)	C 834	1	vinyl acrylic, vinyl acetate, or acetate-ethylene homo or copolymer, fillers	56 to 82	less than 30 %
H	SBR		1	SBR polymer, plasticizers	40 to 85	30 to 50 %
I	chlorosulfonated polyethylene		1	chlorosulfonated polyethylene	90, min	12 to 14 %
J	nitrile		1	acrylonitrile butadiene	40 to 50	30 to 50 %
K	neoprene		1	polychloroprene	50 to 54	20 to 30 %
L	polysulfide (1 part)	C 920	1	liquid polysulfide polymer	90, min	1 to 2 %
M	polysulfide (2 part)	C 920	2	liquid polysulfide polymer	90, min	1 to 2 %
N	polyurethane (1 part)	C 920	1	urethane prepolymer, fillers, pigments, and curing agents	90, min	1 to 2 %
O	polyurethane (2 part)	C 920	2	urethane prepolymer, fillers, pigments, and curing agents	90, min	3 to 5 %
P	silicone (low modulus)	C 920	1	silicone polymers, mineral fillers, pigments, and curing agents	94, min	less than 5 % to less than 10 %
Q	silicone (medium modulus)	C 920 C1184	1	silicone polymers, mineral fillers, pigments, and curing agents	94, min	less than 5 % to less than 10 %
R	silicone (1 part high modulus)	C 920	1	silicone polymers, mineral fillers, pigments, and curing agents	94, min	less than 5 % to less than 10 %
S	silicone (2 part high modulus)	C 920 C1184	2	silicone polymers, mineral fillers, pigments, and curing agents	94, min	less than 10 % to less than 20 %
T	silicone (emulsion)		1	silicone polymers, mineral fillers, pigments, curing agents, and water	70, min	less than 30 %
U	styrene block copolymers (S-B-S or S-I-S)		1	S-B-S or S-I-S polymers, plasticizers	60 to 83	20 to 30 %
V	styrene block copolymers (S-EB-S or S-EB)		1	S-EB-S or S-EB polymers, plasticizers	60 to 90	18 to 25 %
W	silyl-terminated polyether (STPE)	C 920	1	STPE polymers, fillers, pigments and curing agents	96, min	less than 2 %
X	silyl-terminated polyurethane (STPU)	C 920	1	silyl-terminated polyurethane prepolymer, fillers, pigments and curing agents	96, min	less than 4 %

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			5 Curing Process	6 Curing Characteristics	7 Odor Level During Cure	8 Character After Cure
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C570	oxidation of drying oils	skins rapidly, slow cure	mild	plastic
B	butyl (mastic)		solvent release	non-curing	mild	plasto-elastic
C	polyisobutylene		non-curing	non-curing	mild	plasto-elastic
D	butyl (solvent)	C 1085	solvent release	skins rapidly, slow cure	mild	elasto-plastic
E	acrylic (solvent)		solvent release	slow cure	mild	elasto-plastic
F	acrylic (emulsion)	C 834	water evaporation	slow cure	none to mild	elasto-plastic to elastic
G	PVA (emulsion)	C 834	water evaporation	slow cure	none to mild	plastic to plasto-elastic
H	SBR		solvent release	slow cure	mild	elasto-plastic
I	chlorosulfonated polyethylene		moisture activated	slow cure	mild to strong	elastic
J	nitrile		solvent release	data not available	mild to strong	elastic
K	neoprene		solvent release	slow cure	mild to strong	elastic
L	polysulfide (1 part)	C 920	moisture activated, oxidation	dependent on % RH and temperature slow cure	mild to strong	elastic
M	polysulfide (2 part)	C 920	chemical reaction (usually oxidation)	variable, can be controlled, <1 h, >24 h	mild to strong	elastic
N	polyurethane (1 part)	C 920	chemical reaction with moisture from air	RH dependent, slow cure	none	elastic
O	polyurethane (2 part)	C 920	chemical reaction of combined base and curing agent	72-h min cure	none	elastic
P	silicone (low modulus)	C 920	chemical reaction with moisture from air	slow cure, generally neutral chemical release	mild	elastic
Q	silicone (medium modulus)	C 920 C1184	chemical reaction with moisture from air	slow to fast cure, neutral chemical or acid release	mild to strong	elastic
R	silicone (1 part high modulus)	C 920	chemical reaction with moisture from air	medium to fast cure, neutral chemical or acid release	mild to strong	elastic
S	silicone (2 part high modulus)	C 920 C1184	chemical reaction of combined base and catalyst	fast cure, alcohol or no chemical release	none to mild	elastic
T	silicone (emulsion)		chemical reaction with water moisture	slow cure, water release	none	elastic
U	styrene block copolymers (S-B-S or S-I-S)		solvent release	slow to fast cure, no chemical release	mild	elasto-plastic to elastic
V	styrene block copolymers (S-EB-S or S-EB)		solvent release	slow to fast cure, no chemical release	mild	elasto-plastic to elastic
W	silyl-terminated polyether (STPE)	C 920	chemical reaction with moisture from air	slow to medium cure	none	elastic
X	silyl-terminated polyurethane (STPU)	C 920	chemical reaction with moisture from air	medium to fast cure, alcohol or no chemical release	none to mild	elastic

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			9 Service Temperature Range	10 Hardness: Durometer Aged 1 to 6 Months, C 661	11 Hardness: Durometer Aged 5 Years, C 661	12 Adhesion, C 794
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C570	−28 to 70°C (−20 to 158°F)	15 to 50	50 to 90	fair
B	butyl (mastic)		−28 to 82°C (−20 to 180°F)	not applicable	not applicable	fair
C	polyisobutylene		−15 to 70°C (−5 to 158°F)	0 to 5	0 to 10	fair
D	butyl (solvent)	C 1085	−28 to 70°C (−20 to 158°F)	10 to 25	20 to 60	good
E	acrylic (solvent)		−28 to 82°C (−20 to 180°F)	40 to 70	20 to 90	good
F	acrylic (emulsion)	C 834	−28 to 82°C (−20 to 180°F)	15 to 90	20 to 90	good to excellent
G	PVA (emulsion)	C 834	−12 to 82°C (10 to 180°F)	15 to 70	20 to 90	fair to excellent on dry substrates
H	SBR		−28 to 82°C (−20 to 180°F)	10 to 50	20 to 70	fair to excellent
I	chlorosulfonated polyethylene		−40 to 105°C (−40 to 220°F)	24	>24	fair to excellent
J	nitrile		−28 to 82°C (−20 to 180°F)	data not available	data not available	data not available
K	neoprene		−28 to 82°C (−20 to 180°F)	60	>60	fair to excellent
L	polysulfide (1 part)	C 920	−40 to 90°C (−40 to 194°F)	25 to 30	25 to 30	excellent on most substrates
M	polysulfide (2 part)	C 920	−40 to 90°C (−40 to 194°F)	20 to 35	20 to 35	excellent on most substrates
N	polyurethane (1 part)	C 920	−40 to 149°C (−40 to 300°F)	20 to 50	30 to 40	excellent on most substrates
O	polyurethane (2 part)	C 920	−40 to 149°C (−40 to 300°F)	20 to 50	30 to 40	excellent on most substrates
P	silicone (low modulus)	C 920	−51 to 149°C (−60 to 300°F)	15 to 25	no change	excellent on most substrates
Q	silicone (medium modulus)	C 920 C1184	−51 to 130°C (−60 to 266°F)	20 to 50	no change	excellent on most substrates
R	silicone (1 part high modulus)	C 920	−51 to 149°C (−60 to 300°F)	25 to 50	no change	excellent on most substrates
S	silicone (2 part high modulus)	C 920 C1184	−51 to 149°C (−60 to 300°F)	25 to 50	40 to 60	excellent on most substrates
T	silicone (emulsion)		0 to 177°C (−32 to 300°F)	from 10 to 15 to 30 to 60	data not available	fair to excellent
U	styrene block copolymers (S-B-S or S-I-S)		−20 to 60°C (−4 to 140°F)	25 to 70	data not available	fair to excellent
V	styrene block copolymers (S-EB-S or S-EB)		−20 to 70°C (−4 to 158°F)	25 to 70	data not available	fair to excellent
W	silyl-terminated polyether (STPE)	C 920	—40 to 149°C (—40 to 300°F)	15 to 60	no change	excellent on most substances
X	silyl-terminated polyurethan (STPU)	C 920	—40 to 149°C (—40 to 300°F)	15 to 50	minimum to no change	excellent on most surfaces

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			13	14	15	16
			Tack-Free Time	Substrate Staining	Dirt Pickup Resistance	Mildew Resistance
			C 679	C 510		
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C570	24 to 72 h	slight to some	poor to fair	good
B	butyl (mastic)		remains tacky	none	good	good
C	polyisobutylene		remains tacky	slight	poor	good
D	butyl (solvent)	C 1085	24 to 72 h	none to slight	fair to good	good
E	acrylic (solvent)		24 to 72 h	none	good	excellent
F	acrylic (emulsion)	C 834	30 min to 4 h	none	good to excellent	fair to excellent
G	PVA (emulsion)	C 834	less than 30 min	none	good to excellent	fair to excellent
H	SBR		15 to 30 min to 24 h	none	good	good
I	chlorosulfonated polyethylene		24 to 48 h	none	good	excellent
J	nitrile		15 to 30 min	data not available	good	data not available
K	neoprene		15 to 30 min	none	good	excellent
L	polysulfide (1 part)	C 920	less than 72 h	none	good	excellent
M	polysulfide (2 part)	C 920	variable can be controlled< 24 h	none	good	excellent
N	polyurethane (1 part)	C 920	less than 72 h	none	good	excellent
O	polyurethane (2 part)	C 920	less than 24 h	none	good	excellent
P	silicone (low modulus)	C 920	less than 2 h	none to some	fair	fair to excellent
Q	silicone (medium modulus)	C 920 C1184	less than 2 h	none to some	fair	fair to excellent
R	silicone (1 part high modulus)	C 920	less than 1 h	none to some	fair	fair to excellent
S	silicone (2 part high modulus)	C 920 C1184	less than 30 min	none to some	poor to fair	fair to excellent
T	silicone (emulsion)		less than 3 h	none to some	poor	fair to excellent
U	styrene block copolymers (S-B-S or S-I-S)		1 to 24 h	none	good	fair to good
V	styrene block copolymers (S-EB-S or S-EB)		1 to 24 h	none	good	fair to good
W	silyl-terminated polyether (STPE)	C 920	less than 4 h	none	good	excellent
X	silyl-terminated polyurethane (STPU)	C 920	0.5 to 2.5 h	none	good	good to excellent

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			17	18	19	20
			Room-Temperature Flexibility	Low Temperature Flexibility	Abrasion Resistance	Puncture and Shear Resistance
				C 711, C 718, C 734		
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C570	fair	poor	poor	poor
B	butyl (mastic)		good to excellent	good	poor to fair	fair
C	polyisobutylene		good	good	poor	poor
D	butyl (solvent)	C 1085	good to excellent	fair to good	poor	poor
E	acrylic (solvent)		excellent	fair	fair to good	good
F	acrylic (emulsion)	C 834	excellent	good to excellent	good	poor to good
G	PVA (emulsion)	C 834	good	poor to fair	good	good to excellent
H	SBR		excellent	fair	fair	poor to good
I	chlorosulfonated polyethylene		data not available	data not available	fair	data not available
J	nitrile		good	good	fair	good
K	neoprene		excellent	fair	fair	good
L	polysulfide (1 part)	C 920	excellent	excellent	fair	poor to fair
M	polysulfide (2 part)	C 920	excellent	excellent	fair	poor to fair
N	polyurethane (1 part)	C 920	excellent	excellent	excellent	excellent
O	polyurethane (2 part)	C 920	excellent	excellent	excellent	excellent
P	silicone (low modulus)	C 920	excellent	excellent	poor to fair	poor to fair
Q	silicone (medium modulus)	C 920 C1184	excellent	excellent	poor to fair	poor to fair
R	silicone (1 part high modulus)	C 920	excellent	excellent	poor to fair	poor to fair
S	silicone (2 part high modulus)	C 920 C1184	excellent	excellent	poor to fair	poor to fair
T	silicone (emulsion)		excellent	excellent	poor to fair	poor to fair
U	styrene block copolymers (S-B-S or S-I-S)		good	good	fair to good	good
V	styrene block copolymers (S-EB-S or S-EB)		good	good	fair to good	good
W	silyl-terminated polyether (STPE)	C 920	excellent	excellent	good to excellent	excellent
X	silyl-terminated polyurethane (STPU)	C 920	excellent	excellent	good to excellent	good to excellent

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			21	22	23	24
			Shelf Life	Application Life	Application Temperature Range (Substrate)	Primer Use
				C 603		
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C570	6 to 12 months	good to excellent	10 to 40°C (50 to 104°F)	not required
B	butyl (mastic)		2 years	good to excellent	10 to 50°C (50 to 122°F)	not required
C	polyisobutylene		1 to 2 years	excellent	10 to 50°C (50 to 122°F)	not required
D	butyl (solvent)	C 1085	1 to 2 years	good	5 to 50°C (40 to 122°F)	not required
E	acrylic (solvent)		1 to 2 years	fair to excellent	5 to 50°C (40 to 122°F)	not required
F	acrylic (emulsion)	C 834	3 years	excellent	5 to 50°C (40 to 122°F)	not required
G	PVA (emulsion)	C 834	3 years	excellent	5 to 50°C (40 to 122°F)	not required
H	SBR		1 to 5 years	excellent	10 to 40°C (50 to 104°F)	not required to optional
I	chlorosulfonated polyethylene		1 year	excellent	10 to 49°C (50 to 120°F)	not required
J	nitrile		1 year	good	10 to 40°C (50 to 104°F)	not required
K	neoprene		6 months	good	10 to 40°C (50 to 104°F)	not required
L	polysulfide (1 part)	C 920	6 months to 1 year	excellent	5 to 50°C (40 to 122°F)	varies with substrates
M	polysulfide (2 part)	C 920	6 months to 1 year	excellent	5 to 50°C (40 to 122°F)	varies with substrates
N	polyurethane (1 part)	C 920	6 months to 1 year	excellent	5 to 50°C (40 to 122°F)	varies with substrates
O	polyurethane (2 part)	C 920	6 months to 1 year	excellent	5 to 50°C (40 to 122°F)	varies with substrates
P	silicone (low modulus)	C 920	6 months to 1 year	excellent	−29 to 50°C (−20 to 122°F) on frost-free surfaces	varies with substrates
Q	silicone (medium modulus)	C 920 C1184	6 months to 1 year	excellent	−29 to 50°C (−20 to 122°F) on frost-free surfaces	varies with substrates
R	silicone (1 part high modulus)	C 920	6 months to 1 year	excellent	−29 to 50°C (−20 to 122°F) on frost-free surfaces	varies with substrates
S	silicone (2 part high modulus)	C 920 C1184	6 months to 1 year	good	varies with manufacturer	varies with substrates
T	silicone (emulsion)		9 months to 2 years	excellent	5 to 50°C (40 to 122°F)	varies with substrates
U	styrene block copolymers (S-B-S or S-I-S)		1 year to 5 to 10 years	excellent	8 to 50°C (46 to 122°F)	not required to optional
V	styrene block copolymers (S-EB-S or S-EB)		1 year to 5 to 10 years	excellent	8 to 50°C (46 to 122°F)	not required to optional
W	silyl-terminated polyether (STPE)	C 920	9 months to 18 months	excellent	—29 to 50°C (-20 to 122°F) on frost free surfaces	varies with substrates
X	silyl-terminated polyurethane (STPU)	C 920	1 year	excellent	—29 to 50°C (-20 to 122°F) on frost free surfaces	varies with substrates

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			25	26	27	28
			Freeze-Thaw and Heat Stability	Extrudability Resistance	Sag Resistance	Toolability
			C 731	C 1183	C 639	
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 669 C570	6 to 12 months	medium to high	good	fair
B	butyl (mastic)		1 to 2 years	low to medium	good	good
C	polyisobutylene		1 to 2 years	low to medium	fair	fair
D	butyl (solvent)	C 1085	1 to 2 years	low to medium	good	fair
E	acrylic (solvent)		1 to 2 years	low to high	good to excellent	fair to good
F	acrylic (emulsion)	C 834	1 to 2 years	low	excellent	excellent
G	PVA (emulsion)	C 834	1 to 2 years	low	excellent	excellent
H	SBR		1 to 2 years	low to medium	good to excellent	fair to good
I	chlorosulfonated polyethylene		data not available	high	good to excellent	good
J	nitrile		data not available	data not available	poor	data not available
K	neoprene		data not available	low to medium	poor	good
L	polysulfide (1 part)	C 920	6 months	low to medium	good to excellent	less than 30 min
M	polysulfide (2 part)	C 920	1 year, min	low to medium	good to excellent	less than 30 min
N	polyurethane (1 part)	C 920	1 year	low	good to excellent	good
O	polyurethane (2 part)	C 920	1 year, min	low	good to excellent	less than 30 min
P	silicone (low modulus)	C 920	6 months to 1 year, varies with manufacturer	low	good to excellent	less than 30 min
Q	silicone (medium modulus)	C 920 C1184	6 months to 1 year, varies with manufacturer	low	good to excellent	less than 30 min
R	silicone (1 part high modulus)	C 920	6 months to 1 year, varies with manufacturer	low	good to excellent	less than 15 min to less than 30 min
S	silicone (2 part high modulus)	C 920 C1184	6 months to 1 year, varies with manufacturer	low	good to excellent	less than 30 min
T	silicone (emulsion)		0 to 6 months freeze-thaw, 1 to 2 years heat stability	low	good to excellent	less than 30 min
U	styrene block copolymers (S-B-S or S-I-S)		1 to 3 years	low	good to excellent	5 min

TABLE *Continued*

Characteristic or Property and ASTM Test Method			25 Freeze-Thaw and Heat Stability	26 Extrudability Resistance	27 Sag Resistance	28 Toolability
			C 731	C 1183	C 639	
V	styrene block copolymers (S-EB-S or S-EB)		1 to 3 years	low to medium	good to excellent	5 min
W	silyl-terminated polyether (STPE)	C 920	1 year	low	good to excellent	good to excellent
X	silyl-terminated polyurethane	C 920	9 months to 1 year, varies with manufacturer	low	good to excellent	30 to 120 min

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			29 Paintability	30 Drying Time Before Painting	31 Ultraviolet Resistance	32 Ozone Resistance
					C 718, C 734, C 793, C 1257	
Sealant Type and Apploicable ASTM Specification						
A	oleo-resinous	C 669 C570	poor	72 h	poor	poor
B	butyl (mastic)		fair to good	non drying	fair to good	fair to good
C	polyisobutylene		no	non drying	fair	fair
D	butyl (solvent)	C 1085	fair to good	1 week, min	fair to good	fair to good
E	acrylic (solvent)		good	24 h	excellent	excellent
F	acrylic (emulsion)	C 834	excellent	less than 1 h to 24 h	excellent	good to excellent
G	PVA (emulsion)	C 834	excellent	1 h	fair to excellent	fair to excellent
H	SBR		good	1 to 24 h	fair	poor to fair
I	chlorosulfonated polyethylene		good	24 h	good to excellent	good to excellent
J	nitrile		good	24 h	fair	fair
K	neoprene		good	48 h	fair	fair
L	polysulfide (1 part)	C 920	good	12 h	fair to good	fair to good
M	polysulfide (2 part)	C 920	good	12 h	fair to good	fair to good
N	polyurethane (1 part)	C 920	good	3 to 4 weeks	good	good
O	polyurethane (2 part)	C 920	good	2 to 4 weeks	good	good
P	silicone (low modulus)	C 920	poor	not applicable	excellent	excellent
Q	silicone (medium modulus)	C 920 C1184	poor	not applicable	excellent	excellent
R	silicone (1 part high modulus)	C 920	poor	not applicable	excellent	excellent
S	silicone (2 part high modulus)	C 920 C1184	poor	not applicable	excellent	excellent
T	silicone (emulsion)		fair to good, may vary with time after cure	2 to 24 h	excellent	excellent
U	styrene block copolymers (S-B-S or S-I-S)		good	1 to 6 h	fair	poor
V	styrene block copolymers (S-EB-S or S-EB)		good	1 to 6 h	good	excellent
W	silyl-terminated polyether (STPE)	C 920	excellent	less than 4 h	excellent	good to excellent
X	silyl-terminated polyurethane	C 920	good	2 to 4 h	good to excellent	good to excellent

Characteristic or Property and ASTM Test Method			33	34	35	36
			Artificial Weathering and Heat Aging			
			Wash Out	Cracking	Discoloration	Adhesion Loss
			C 732	C 718, C732, C792, C793	C 732, C792	C 718, C732, C1257
Sealant Type and Applicable ASTM Specification						
A	oleo-resinous	C 660 C570	none	some	yellows	some
B	butyl (mastic)		none	none	none	none
C	polyisobutylene		none	none to some	very little change	none
D	butyl (solvent)	C 1085	none	none to some	slight	none to slight
E	acrylic (solvent)		none	none	none to slight	none to slight
F	acrylic (emulsion)	C 834	none	none	none to slight	none to slight
G	PVA (emulsion)	C 834	none	none	none to slight	none to slight
H	SBR		none	none to some	yellows	none to slight
I	chlorosulfonated polyethylene		none	none	none	none
J	nitrile		none	none	yes	none
K	neoprene		none	none	yes	none
L	polysulfide (1 part)	C 920	none	none to some	yes	none
M	polysulfide (2 part)	C 920	none	none	yes	none
N	polyurethane (1 part)	C 920	none	none	yes	none
O	polyurethane (2 part)	C 920	none	none	yes	none
P	silicone (low modulus)	C 920	none	none	none	none

TABLE *Continued*

Characteristic or Property and ASTM Test Method			33	34	35	36
			Artificial Weathering and Heat Aging			
			Wash Out	Cracking	Discoloration	Adhesion Loss
			C 732	C 718, C732, C792, C793	C 732, C792	C 718, C732, C1257
Q	silicone (medium modulus)	C 920 C1184	none	none	none	none
R	silicone (1 part high modulus)	C 920	none	none	none	none
S	silicone (2 part high modulus)	C 920 C1184	none	none	none	none
T	silicone (emulsion)		none	none	none	slight loss to wood
U	styrene block copolymers (S-B-S or S-I-S)		none	none to some	yellows	none
V	styrene block copolymers (S-EB-S or S-EB)		none	none	very little change	none
W	silyl-terminated polyether (STPE)	C 920	none	none	none	none
X	silyl-terminated polyurethane (STPU)	C 920	none	none	some to none	none

TABLE 1 *Continued*

Characteristic or Property and ASTM Test Method			37	38	39
			Extension Recovery	Movement Capability	Life Expectancy
			C 736	C 719	
Sealant Type and Applicable ASTM Specification					
A	oleo-resinous	C 669 C570	poor	±2 %	1 to 5 years
B	butyl (mastic)		poor	±7.5 %	5 to 10 years
C	polyisobutylene		poor	±5 %	10 years
D	butyl (solvent)	C 1085	50 to 100 %	±7.5 %	5 to 10 years
E	acrylic (solvent)		50 to 100 %	±10 %	5 to 10 years
F	acrylic (emulsion)	C 834	75 to 100 %	±7.5 % to ±25 %	5 to 20 years, min
G	PVA (emulsion)	C 834	75 to 100 %	±7.5 %	5 to 15 years
H	SBR		75 to 100 %	±5 % to ±10 %	1 to 5 years
I	chlorosulfonated polyethylene		90 to 100 %	±12.5 % to ±20 %	5 to 15 years
J	nitrile		data not available	±50 %	5 years
K	neoprene		90 to 100 %	±20 %	5 years
L	polysulfide (1 part)	C 920	90 to 100 %	±25 %	10 to 20 years
M	polysulfide (2 part)	C 920	90 to 100 %	±25 %	10 to 20 years
N	polyurethane (1 part)	C 920	90 to 100 %	±25 % to ±50 %	10 to 20 years
O	polyurethane (2 part)	C 920	90 to 100 %	±25 % to ±50 %	10 to 20 years
P	silicone (low modulus)	C 920	90 to 100 %	±25 % to + 100 % − 50 %	20 years, min
Q	silicone (medium modulus)	C 920 C1184	90 to 100 %	±25 % to ±50 %	20 years, min
R	silicone (1 part high modulus)	C 920	90 to 100 %	±25 %	20 years, min
S	silicone (2 part high modulus)	C 920 C1184	90 to 100 %	±12.5 % to ±25 %	20 years, min
T	silicone (emulsion)		90 to 100 %	±25 %	15 years, min
U	styrene block copolymers (S-B-S or S-I-S)		90 to 100 %	±10 % to ±25 %	1 to 5 years
V	styrene block copolymers (S-EB-S or S-EB)		90 to 100 %	±10 % to± 25 %	10 to 20 years
W	silyl-terminated polyether (STPE)	C 920	90 to 100 %	±25 % to + 100 % -50%	20 to 25 years
X	silyl-terminated polyurethane	C 920	90 to 100%	±25 % to + 100 % -50%	15 to > 20 years