Sealant Adhesion & Compatibility Study Report

Date: October 1, 2013; revised February 2014
To: QA/QC
From: Sharon Libby, WCC

Re: **Sealant Adhesion and Compatibility Study**

Introduction - Purpose of the experiment:

Sealant adhesion and compatibility are critical parts of designing and specifying weatherproofing systems in buildings. In general, sealants are used for both weather / air tightness sealing and in structural joints, which can also be part of the air and moisture control layers. Sealants must possess certain properties in order to properly work as air and moisture controls. Those properties almost always include adhesion to various substrates such as weather-resistive barriers (WRBs), self-adhered membranes (SAMs), liquid-applied membranes (LAMs), roofing membranes, and cladding materials. Chemical compatibility is also important as it is typical in construction to have various materials in contact with one another. This contact can occur as designed, as in the case of a window perimeter sealant joint that touches both the window frame and the adjacent cladding. It can also occur inadvertently, such as asphaltic or butyl vapor migration from a post-wrap SAM over a window flange through a backer rod, discoloring the sealant.

Depending on specific field applications and adjacent materials, the properties critical to and required for a project may vary. However, for the purposes of comparing several sealants and substrates, adhesion is tested with quantifiable results in this study: *Resistance is measured in pounds at the point of failure, using a standard pull test procedure. The failure modes are also recorded.*

Compatibility is a qualitative observation that is noted at the time of the pull tests. Discoloration or staining of the sealant and/or the substrate is one typical sign of a reaction between the materials. Other qualitative types of information recorded are generally comparisons of observations related to conducting the pull tests such as workability, elongation, and curing processes.

The goals of this sealant study are to:

- Observe and compare various sealants applied to typical substrates.
- Test recommended and inadvertent applications.
- Gain a general understanding of sealant and substrate chemistry in relation to how they are expected to perform in field applications.
- Measure adhesion and record modes of failure.
- Create a document with comparative analysis of the tested sealants to substrates that can be used as a guide to select sealants appropriate for use with given substrates.

How this study relates to other testing:

Pre-construction sealant testing is common at both the manufacturer and contractor level and is required by many specifications. Sealants manufacturers test in their labs to verify a variety of properties that are usually listed on the product's data sheet. They can include: working time, flow (sag or slump), VOC content, tensile adhesion strength, elongation, and joint movement capability. These "Typical Properties" are referenced to an ASTM or other standard where applicable, and are measured properties. Manufacturers also test for compatibilities with typical substrate materials and list "Approved Substrates" as part of the sealant's product data.

Pre-construction field adhesion testing is commonly specified and is typically conducted by the manufacturers' field representatives. In practice, it is best to test the actual materials that will be used in construction as unannounced manufacturing changes can alter material chemistry and performance. Simple pull tests with a tooled sealant bead against a single substrate should be done first. Once a mock-up is constructed joint testing can be done not only with the actual materials, but also in their actual application and dimension. Testing a movement joint with two substrates is very different than the previously described single substrate test; however, both provide critical information during pre-construction.

In-service field adhesion testing is typically required throughout the construction duration, as well, for the same reasons of verifying adhesion and compatibility. *ASTM C1521-09 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints* is a commonly used standard that describes various adhesion testing methods for in-service sealant joints.

This study and testing closely relates to pre-construction field adhesion testing, with a single bead of tooled sealant pulled from a single substrate. The study does not follow any ASTM standard.

Procedure:

<u>Test Boards & Substrates</u>

Test boards for WRBs and SAMs were made with two strips, generally 12" tall x 48" in length, of each material applied to 48" x 32" corrugated plastic boards. Blue painters tape was applied at the top edge[1] of the membrane to serve as a release and starter for the pull tab of sealant.

LAMs were applied to exterior grade gypsum sheathing in two strips, generally 12" tall x 48" in length. The LAMs were applied at the manufacturer's recommended millage.

Cladding materials ranged in size and shape available. Each cladding substrate had sealant beads applied as best fitted to the sample.

Sealant Bead Application

Generally, three beads of each sealant tested were applied to each substrate. The beads were between 8" and 12" in length to be sufficient for both a pull tab and pulling distance. The beads were also purposefully continued across the edge[1] of the WRBs and SAMs to test for compatibility with both the membrane facing and adhesive backing layers. All sealants were tooled with a sealant tool to obtain consistent contact with the substrate.

During the sealant bead application and testing process it was found that the bead size, specifically the depth of the bead, was an important factor in getting a sufficiently sized pull tab and thus pull test from each bead. Some sealants tended to flatten and shrink after application leading to difficulty in creating a pull tab for testing. Larger bead sizes allowed for better pulls; however, this change throughout the testing could have lead to inconsistency in results due to a change in surface area contact and cross sectional area of each bead. For each pairing, the test beads were applied at the same time and in the same general dimension. Therefore, the results are still relative and able to be compared to each other.

Sealant & Substrate Pairing

A matrix of sealant and substrate types was created using both manufacturer approved substrates for each sealant as well as typically specified sealants and substrates. Consideration was also given to typical membrane and cladding junctures such as at transitions, penetrations, flashings, or at cladding material terminations.

Manufacturers' product data was referenced and technical representatives were contacted to provide feedback on substrate and primer suggestions. Not every sealant / substrate pairing was directly recommended by the manufacturers of either, but was still tested to complete the comparisons established by the matrix. The goal of gaining a general understanding of how each sealant adheres to various substrates and the comparison between related substrates and related sealants prevailed in this decision for testing.

Sealants Tested

Type	**Manufacturer**	**Product Name**	**Joint Movement Capability**
Silicone	Dow	Dow 790	+100/-50 %
Silicone	Dow	Dow 791	+50/-50 %
Silicone	Dow	Dow 795	+50/-50 %
Silicone	Dow	Dow 758	+25/-25 %
Silicone	Dow	C.W.S.	+40/-40 %
Silicone	Tremco	Spectrem 1	+100/-50 %

[1] *Initially, the test boards were prepared with a gap between the top edge of the substrate and the blue tape. This was intended to allow the sealant bead to be in contact with the membrane's edge for compatibility observations. Several sealants bonded to the backing material which made it difficult to then cut a pull tab cleanly away from the substrate face and/or backing. Later in the testing, blue painters tape was applied over the edge of the membrane to prevent contact with the edge. The membrane edge compatibility test was then moved to the lower edge of the strip where it would not be in conflict with the pull tab.*

STP	BASF	Sonolastic 150 VLM	+50/-50 %
STP	Chem Link	Chem Link M-1	+25/-25 %
STP	Prosoco	Air Dam	+100/-50 %
Elastomeric Poly.	Henkel	OSI Quad	+25/-25 %
Elastomeric Poly.	Henkel	OSI Quad Low VOC	+25/-25 %
Elastomeric Poly.	Tremco	Tremco 830	+12.5/-12.5%
Polyurethane	Tremco	Vulkem 116	+25/-25 %
Polyurethane	Tremco	Dymonic 100	+50/-50 %
Polyurethane	Sika	Sikaflex-15LM	+100/-50 %
Polyurethane	Bostik	Chem-Calk 2000	+25/-25 %
Acrylic Urethane	Henkel	OSI H2U Greenguard	+25/-25 %

Primers

Dow 1200 OS
Dow Primer P
Sika 429
Sonolastic 733
Tremco Dymonic 171
Tremco Silicone Porous

Substrates Tested

Type	Manufacturer	Product Name	Material
WRB	Dupont	Tyvek Commercial Wrap	Spunbonded olefin
WRB	Dupont	Tyvek Commercial Wrap D	Spunbonded olefin
WRB	Fortifiber	WeatherSmart	Non-woven polyolefin fabric coated on one side with a polyolefin-based coating
WRB/SAM	Grace	Perm-A-Barrier	Rubberized asphalt/polyethylene
WRB	Grace	Perm-A-Barrier VPS	Polyethylene sheet w/ synthetic adhesive
SAM	DuPont	StraightFlash	Spunbonded polyethylene laminate (face) Butyl rubber (adhesive)
SAM	Dupont	FlexWrap NF	micro-creped polyethylene laminate (face) Butlyl rubber (adhesive)
SAM	Fortifiber	FortiFlash - Butyl	Polyolefin (face), butyl (adhesive)
SAM	Fortifiber	FortiFlash – 40mil	Polyethylene(face), SBS modified asphalt(core)
SAM	Grace	Vycor Aluminum	Polyethylene aluminum (face), rubberized asphalt (adhesive)
SAM	Grace	Vycor Plus	Polyethylene (face), rubberized asphalt (adhesive)

SAM	Grace	Vycor V40	Polyethylene (face), rubberized asphalt (adhesive
SAM	Henry	Blueskin SA HT	Polyethylene(face) SBS modified asphalt (core)
SAM	Henry	Blueskin SA	Polyethylene(face) SBS modified asphalt (core)
SAM	Henry	Foilskin	Aluminum foil (face) SBS rubberized asphalt (core)
SAM	Henkel	OSI TeQ::Flash Butyl	Rubberized asphalt (core), butyl (back)
SAM	Henkel	OSI TeQ::Flash	Polypropylene (face), rubberized asphalt (back)
SAM	Protecto Wrap	Protecto Seal 45	Aluminum foil / polyethylene (face) butyl (adhesive)
SAM	Protecto Wrap	PW 100/40	Polyethylene (face), (butyl adhesive)
SAM	Waterblock	Waterblock 40 Mil	Polyethylene(face), SBS modified bitumen(core)
SAM	Waterblock	Waterblock Foil Face	Aluminum (face), SBS modified bitumen(core)
SAM	Waterblock	Waterblock HighTemp-40	Polyethylene(face), SBS modified bitumen(core)
LAM	Prosoco	FastFlash	Silyl-Terminated-Poly-Ether (STPE)
LAM	Prosoco	R-Guard Cat5	Silyl-Terminated-Poly-Ether (STPE)
LAM	STO Corp.	STO Guard Gold Coat	Acrylic Latex
LAM	Henry	Air-Bloc 33MR	Water-based Elastomeric Emulsion
LAM	Dow	Defend Air 200	Silicone
LAM	BASF	Enershield	SBR (styrene butadiene resin) Synthetic Rubber
Cladding	James Hardie	Hardie Plank	Fiber Cement Siding
Cladding	James Hardie	Hardie Panel	Fiber Cement Panel Siding
Cladding	James Hardie	Hardie Trim	Fiber Cement Trim
Cladding	Trespa	Meteon	HPL panel
Cladding	Azek	Azek Trim	PVC
Cladding	Boral	TruExterior Trim	Poly-ash
Cladding	n/a	Masonry	Brick
Cladding	n/a	Metal Panels	Kynar Finish
Cladding	n/a	Wood	Primed Cedar
Windows	Cascadia	Fiberglass	Painted and unpainted fiberglass
Windows	VPI	Vinyl	Painted and unpainted vinyl
Roofing	Firestone	Firestone 60 mil	TPO roofing membrane

Pull Test Procedure

Sealant beads were generally tested at seven and 14 days after their application date, starting with the left hand bead. The third bead, on the right, was left as an example pull for training and demonstration purposes.

Each sealant bead had a pull tab created by either lifting the release tape or separating the bead from the membrane with a utility blade along the top of each membrane. In some cases, depending on the sealant's reaction to the substrate material, the bead had sunken into the substrate making it difficult to cut a pull tab cleanly away from the substrate. In a few cases, where sealants had not fully cured in time for the seven day pull test, the bead was too soft to be pulled. This was noted in the results.

Each pull tab was pulled upward at a 90 degree angle from the undisturbed portion of the sealant bead. A clamp was used to attach the end of the pull tab to a spring scale to measure the force of each pull. The pull tabs were stressed until failure by adhesion, cohesion, or substrate. The force displayed on the spring scale was recorded at the point of failure.

Photos: (left) pull test in process, (right) scale with clamp.

Equipment: Ohaus 8008-PN spring scale was used to measure the force of each pull. The scale has a range of measurement from 0.0 to 11.25 pounds.
Two clamps were used: A large binder clip and a small vise grip. Note that the binder clip was used less throughout the study because it did not hold the tab as securely as the vise grip which could be adjusted.

Modes of Failure: **Adhesive (AF)** – When the sealant bead lost its adhesion to the substrate surface.
Cohesive (CF) – When the sealant bead lost cohesive strength within the bead itself (tore or broke apart).
Substrate (SF) – When the substrate, generally described as the material to which the sealant was applied, failed by tearing, ripping, losing adhesion to the test board, delaminating, or in some other way degrading. For LAMs, failure of the membrane to stay adhered to the exterior gypsum sheathing was noted as **LF** rather than **SF** to clarify that the failure was at the membrane and not the gypsum board.
No Fail (NF) – When the sealant bead and substrate did not exhibit any failure at or above the scale's maximum reading of 11 pounds. If failure could be caused by a stronger pull done by hand, then that failure mode was noted as > 11 or with a "+" sign.

Results:

The attached spreadsheets show the pull test results separated by substrate types:

- Self-Adhered Membranes (SAMs)
- Weather Resistive Barriers (WRBs) including sheet and liquid applied
- Cladding, Windows, and Roofing (Claddings)

The tested sealants are listed vertically on the left, separated into four categories of sealant types: Silicone, STPe, elastomeric polymer, and polyurethane. The substrates are listed across the top of each spreadsheet, separated by manufacturer and general type. Each sealant to substrate pairing underwent two pull tests: one at approximately seven days and another at approximately 14 days. The exact dates were recorded, along with the pull strength at failure and the mode of failure.

Trends were identified by comparing the pull strengths between the seven and 14 day test pulls and by noting the general level of pull strength achieved per sealant and substrate type. The goal was to gain a basis for comparison between the sealants and substrate pairings. The test not meant for precise or structural analysis. The pull test values do not represent actual structural strength of the sealant or bond strength in any application. This method of recording pull strengths also does not take into account the manufacturers' designed properties or make any determination as to whether the sealant performed per its specification.

<u>Trends – Seven to 14-Day Pull Strengths</u>

The difference in pull strengths from the seven to 14-day test pulls was of particular interest due to the significance of scheduling in construction. Most sealant manufacturers recommend a cure time of seven to 14 days with particular atmospheric conditions. This time requirement along with the need to conduct periodic pull tests, can limit work on adjacent surfaces or by subsequent trades.

For each sealant-to-substrate pairing, the results were color-coded to show if the pull strengths increased, remained static (within 0.5 lb), or decreased in pull strength from the seven to 14-day pull test. The green cells are those pairings that increased in strength, yellow cells remained static, and red cells decreased.

- Of the pull tests done on SAMs, 126 out of 255 (or 49%) increased in pull strength from the seven to 14-day test pulls. This was the majority trend with 84 remaining static and 45 decreasing in pull strength.

- Of the pull tests done on WRBs, 51 out of 164 (or 31%) increased in pull strength from the seven to 14-day test pulls. However, 90 (or 55%) of the test pulls remained static, within 0.5 pound. The majority trend with WRBs is that the pull strengths did not increase significantly when given more cure time.

- Of the pull tests done on Claddings, 48 out of 161 (or 30%) increased in pull strength from the seven to 14-day test pulls. However, 91 or (57%) of the test pulls remained static, within 0.5 pound. The majority trend with Claddings is that the pull strengths did not increase significantly when given more cure time.

<u>Seven to 14-Day Pull Strength Conclusions</u>

The comparison of the seven to 14-day test pulls showed that the majority of sealants applied to SAMs gained in pull strength whereas sealants applied to WRBs and Claddings did not. This could be a result of the SAMs somehow inhibiting immediate curing. The typical conditions required for sealants to cure are exposure to air and, with some sealants, moisture. Since the testing was done indoors in a relatively controlled environment, the SAMs could be seen as blocking more air than either the WRBs or Claddings. This is important to consider in construction when scheduling for cure times; sealant installations on less air permeable substrates and in more air tight conditions may take longer to cure.

All substrate types had a minimal number of sealants that decreased in pull strengths. While not proving to be a consistent occurrence in the testing, 13 – 18% of the sealants tested decreased in pull strength over time. Typical failure rates are important to consider in construction, even with fairly consistently performing materials. Of course, decreased pull strengths in this study do not necessarily point to failures in the field, but could point to how a sealant to substrate combination might gain or lose strength over time. For instance, in many of the decreased pull strength pairings the mode of failure changed from cohesive (CF) to adhesive (AF). This could mean that the sealant tended to bond better within itself over time to a point of weakening the adhesive properties it initially had with the substrate.

Comparative Pull Strengths

The method of recording pull strengths in pounds was intended to provide a general comparison of sealant to substrate bond strengths. Because there are multiple modes of failure possible, the strengths represent slightly different properties in each pairing. For instance, if a particular pull test exhibited substrate failure then the recorded result is more telling of the substrate's strength and the adhesive bond than the sealant's cohesive strength since that property was not able to be tested to capacity. It is important to also note that no weather seal joint requires 11 pounds of adhesive strength. In many cases what is required by sealant and substrate manufacturers or by the intended design of the assembly could be much less. Again, the pull strengths were not a determination of whether the sealant performed to the manufacturer's specified performance standards.

Noting the above caveats to deciphering the results, the recorded pull strengths in pounds at failure were grouped into four ranges to better analyze which pairings had stronger relationships than others. A gradient of blue tones was applied to the different ranges: 0 to <3 pounds, 3 to <6 pounds, 6 to <9 pounds, and 9 to >11 pounds.

SAMs

- Of the pull tests done on SAMs, the polyurethane sealants exhibited high pull strengths most consistently, with silicone and STPe sealants close behind.
- All of the elastomeric polymer sealants had relatively low pull strengths when applied on SAMs regardless of whether the facing material was polyethylene or metal.
- Generally, including all types of sealants tested, pull strengths were not higher depending on the SAM facing material: metal or polyethylene.
- The polyurethane sealants showed higher pull strengths to the polyethylene faced SAMs than the metal faced SAMs.
- Comparisons could be made between sealant types and SAM types; however, they seemed to vary among the SAM materials manufacturers. Specific product comparisons could be made using the results though, such as on Protect Wrap's PS45: silicone and STPe sealants had higher pull strengths than with the polyurethane sealants. The opposite was true for Protecto Wrap's PW 100/40.

WRBs

- Sealant pull strengths to the mechanically attached, permeable WRBs were generally low. Note that Grace Perm-A-Barrier was recorded with the WRBs but should really be considered a SAM since it has asphalt-based backing and is not vapor permeable (less than 0.1 perms). Grace Perm-A-Barrier VPS does have an adhesive backing, but it is not butyl or asphalt-based. Grace Perm-A-Barrier VPS is also vapor open at 15 perms. Since it is meant to perform more similarly to the mechanically attached, permeable, sheet applied WRBs it is grouped with that membrane type.

- Sealant pull strengths to the permeable LAMs were notably higher than the permeable, mechanically attached WRBs, with the exception of one LAM.
- All of the elastomeric polymer sealants had relatively low pull strengths when applied on the mechanically attached WRBs or LAM.
- Silicone and STPe sealants had the most consistently high pull strengths on the LAMs.

Claddings

- All of the elastomeric polymer sealants had relatively low pull strengths when applied on the tested claddings and windows.
- Pull tests done with the manufacturers' recommended primers, overall, had consistently high pull strengths.
- Specific product comparisons showed variances in pull strengths between the same window frames with different coatings: Polyurethane sealants exhibited much better adhesion with VPI painted vinyl than they did with VPI white (uncoated) vinyl.

Comparative Pull Strength Conclusions

An apparent consistency of strong pull strengths throughout the testing was evident between sealants and substrates that were similar in basic chemistry. Some examples: A polyurethane sealant to a polyethylene-faced SAM or polyurethane coated window frame. It was also found that bonding surfaces may not always be what they seem. For example, the majority of SAMs and mechanically-attached WRBs are polyethylene or polyethylene-faced respectively however, they had drastically different pull strengths in our testing. It is known that several SAM and WRB manufacturers apply surface coatings to their membranes which could have an effect on a sealant's ability to bond to the membrane. In fact, the study showed adhesion differences across inked portions of membranes, such as where product brand labeling was applied to a SAM or WRB. Therefore it is reasonable to conclude that manufacturer applied coatings could also have a similar effect. Another possible effect to the bonding surface could come from the specific manufacturing process. The mechanically-attached WRBs are more permeable than the SAMs, although both are polyethylene or polyethylene-faced materials. The difference in permeability is a deliberate outcome of the manufacturing process. The manufacturing process could also have effect on the bonding surface. The importance in finding adhesive differences relating to coatings is to be aware that adhesion could be affected by variables in addition to a product's general chemistry that might not be identified in the manufacturer's literature.

Similarly, it was found that the pull strengths of the poly-faced versus metal faced SAMs were not consistent across all silicone and STPe sealants. Some consistencies could be seen within manufacturers' products groupings, but no widespread conclusion could be applied. Sealant manufacturers note approved substrates, porous or non-porous, and/or primer recommendations. These typically address non-cladding substrates as well, such as SAM facings. Again, testing should always be conducted with the project-specified materials to determine the best solution for a multiple-substrate application.

Permeable LAMs are becoming more commonly specified for air and moisture controls in place of traditional, mechanically-applied WRBs. While the chemistry of the LAMs varies among manufacturers, in general silicone, STPe, and polyurethane sealants had markedly higher pull strengths when adhered to these products. Manufacturers of mechanically applied WRBs may not require excessively strong adhesion to their products for a concealed and protected air seal; however, consider that even within the 0 to <3 pound range the majority of pull tests were below one pound of resistance.

The only group of sealants that performed moderately well on the mechanically applied WRBs (with the exception of Dow 758 that was specifically designed for adhesion to Tyvek) was the elastomeric polymers. However, this particular group of sealants consistently exhibited the lowest adhesion strengths on all other substrate types tested. Throughout testing it was also noted in the application phase that the elastomeric polymers were highly solvenated, leading to strong odors (two out of three sealants tested) with continued off-gassing and obvious shrinkage and soaking into the substrates. The exact chemical composition varies among manufacturers of elastomeric polymers. Using a general term like “polymer” to define a sealant limits a users’ ability to draw conclusions between the observed performance, compatibilities and chemistry of the products.

All pull tests to claddings, with one exception, that were done with the manufacturers’ recommended primers had consistently high pull strengths. It can be concluded that primers tended to create strong surface adhesion with the sealants tested. The one exception to this was Sika 429 on Hardie Plank, where the pull test failed dramatically when the primer itself lost adhesion to the substrate. The seven-day pull test failed in this manner at 10 pounds and the 14-day pull test failed, same mode, at two pounds. In the field, this could have led to a decrease in joint strength over time. Primers are not always needed for the project specific required performance even where recommended by the manufacturer. Many contractors, design professionals, and manufacturers agree that the best approach to using primers is only when needed since it adds another material and step to the work process. This is reflected by some manufacturers allowing field adhesion testing to overrule their standard recommendations per substrate. Of course, the need for primers should be verified by testing for each project.

<u>Compatibility</u>

Compatibility was observed during the pull test process and was typically noted as discoloration or staining of the sealant and/or the substrate:

- Polyurethane sealants and Tremco 830, an elastomeric polymer, most consistently showed staining when in contact with the asphalt or butyl backing of a SAM. Some STPe sealants showed very slight staining.

The testing process used in this study limited opportunities for dramatic reactions of incompatibility. Field testing of project specific materials should always include compatibility testing as well as adhesion testing. This study showed that a consistent area for incompatibility is a sealant in contact with the adhesive backing of a membrane. This is somewhat unexpected from a designed joint standpoint; however, field experience has shown that making the assumption that products will not inadvertently come into contact with each other is incorrect. Therefore experience, mock-ups, and further testing should be used to gain a better understanding of material compatibilities.

Experience and common knowledge regarding materials was also applicable and proven in this study:

Observation	Experience & Knowledge
The only acrylic urethane tested, OSI H2U Greenguard, severely discolored when applied to primed cedar.	Cedar has tannins that may have leached into the acrylic urethane sealant. The only other sealant that was affected was one silicone that had a slight stain at the back of the bead.
Slight discoloration and slumping was observed on some polyurethanes, most notably Tremco's Vulkem 116, when applied to Dow's Defend Air, a silicone LAM. It was also observed that none of the polyurethane sealants bonded well to the silicone LAM.	Silicone and polyurethane materials are not generally good adhesive partners, although testing should always be done to confirm adhesion and compatibility since every manufacturers' specific chemical formulations are different and can change by design or environment.
A change in sheen was observed in a perimeter around the silicone sealants when applied onto the silicone LAM, Dow's Defend Air 200.	Chemical migration of this type is common with stone cladding and can cause discoloration. Chemical migration does not always affect the adhesion or other performance characteristics of the sealant but this should be verified with the manufacturer.
Dow 790 silicone sealant was applied to brick after the brick was sprayed with isopropyl alcohol (IPA), which inhibited its cure.	Isopropyl alcohol (IPA) is a common carrier for brick water repellants and can be used as a cleaner prior to sealant application. Cure inhibition can occur if the IPA is not fully evaporated before sealants are applied.
Bubbles were observed in two of the sealant beads; however they appeared to be anomalies since there was no pattern to the occurrences.	Although not a sign of a compatibility issue in the study, bubbles are a common indicator of air movement through sealant. While not always a chemical compatibility issue, the presence of air bubbles may be undesired in construction or may affect the overall sealant joint dimension by reducing the sealant depth at the bubble. The bubbles observed could also be a result of the manufacturing and packaging processes.

End of Report

Attached:
WCC Sealant Adhesion Study 2013 - Sealants to Substrates Matrix

- SAMs, Seven to 14-Day Adhesion Pull Tests
- SAMs, Pull Strengths
- SAMs, Foil & Polyethylene Faced Comparison, Pull Strengths
- WRBs, Seven to 14-Day Adhesion Pull Tests
- WRBs, Pull Strengths
- Claddings, Seven to 14-Day Adhesion Pull Tests
- Claddings, Pull Strengths

How to Read the Matrixes

Materials: Tested sealants are listed per general grouping (Silicone, STPe, Elastomeric Polymer, and Polyurethane) vertically on the left. Substrates are listed across the top and are separated on different pages depending if the substrate is a self-adhered membrane (SAM), weather resistive barrier (WRB), or type of cladding or window (Cladding).

Results: Pull strengths at failure and the mode of failure were recorded for each pull test conducted. The pull strengths ranged from 0 to >11 pounds. The failure modes were adhesive (AF), cohesive (CF), or substrate (SF). In some cases, for LAMs, the liquid-applied material lost adhesion to the exterior gypsum board without damaging the facing material. This was recorded as a failure of the LAM (LF). If no failure was apparent, no fail (NF) was recorded.

Seven to 14-Day Pull Strengths:
For each sealant-to-substrate pairing, the results were color-coded to show if the pull strengths increased, remained static (within 0.5 lb), or decreased in pull strength from the seven to 14-day pull test. The green cells are those pairings that increased in strength, yellow cells remained static, and red cells decreased.

Pull Strength Comparison:
The recorded pull strengths in pounds at failure were grouped into four ranges. A gradient of blue tones was applied to the different ranges: 0 to <3 pounds, 3 to <6 pounds, 6 to <9 pounds, and 9 to >11 pounds.

Disclaimer: This study was not done per any ASTM standard and makes no claim to assess the sealants and/or substrates tested in comparison to their manufacturer's published performance standards. The pull strengths were recorded to establish a basis of comparison; they imply no judgment as to structural integrity of the materials tested.

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - SAMs, Seven to 14-Day Adhesion Test Pulls

Sealant Pull-Test Results 2013		WX		WX		WX		WX		WX		AX		AX		AX		AX		AX		WX		WX		WX		WX		WX		WX		WX						
SEALANTS	SUBSTRATES	Date: 7/22/13 Protecto Wrap PS 45		Date: 7/22/13 Protecto Wrap PW 100/40		Date: 7/15/13 Waterblock 40 Mil		Date:7/15/13 Waterblock High Temp - 40 Mil		Date: 7/15/13 Waterblock Foil Face - 40 Mil		Date: 7/22/13 Fortifiber Fortiflash - 40 mil		Date: 7/22/13 Fortifiber Fortiflash - Butyl		Date: 7/17/13 Grace Vycor V40		Date: 7/17/13 Grace Vycor Plus		Date: 7/17/13 Grace Vycor Aluminum Flashing		Date: 7/22/13 Henry Blueskin SA		Date: 7/22/13 Henry Blueskin SA LT		Date: 7/22/13 Henry Foilskin		Dtae 7/17/13 Dupont StraightFlash		Date: 7/15/13 Dupont FlexWrap NF		Date: 7/15/13 OSI TeQ Flash		Date: 7/8/13 OSI TeQ Flash Tape (FF)				Increased Strength	No StrengthChange	Decreased Strength
	Pull Test Day:	7/31/13	8/9/13	7/29/13	8/9/13	7/22/13	7/29/13	7/22/13	7/29/13	7/22/13	7/29/13	7/31/13	8/9/13	7/31/13	8/9/13	7/24/13	7/31/13	7/24/13	7/31/13	7/24/13	7/31/13	7/29/13	8/9/13	7/29/13	8/9/13	7/29/13	8/9/13	7/24/13	7/31/13	7/22/13	7/29/13	7/22/13	7/29/13	7/19/13	7/22/13					
Silicones:																																								
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		Dow 790				
	Failure	CF 5.0	CF 7.25	CF 6.25	AF 6.0	CF 4.0	CF 4.25	CF 3.25	CF 4.0	AF 3.0 CF 3.0	CF 2.5	CF 5.25	CF 5.75	CF 3.25	CF 5.25	AF 2.5	AF 5.25	CF 4.0	CF 4.5	AF 3.25	AF 4.0	CF 9.0	CF 7.5	CF 6.0	CF 5.0	CF 4.25	CF 5.5 AF +	AF 5.25	AF 5.0	CF 3.0	AF 4.0	CF 2.75	CF 4.0	CF 2.5	CF 2.5		(15) Same Failure (2) Diff. Failure			
	Results	Increased Pull Same Failure		Same Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure				8	7	2
Dow 791	Primer	no primer		1200 OS		1200 OS		1200 OS		no primer		1200 OS		1200 OS		1200 OS		1200 OS		no primer		1200 OS		1200 OS		no primer		1200 OS		1200 OS		1200 OS		no primer		Dow 791				
	Failure	NF 11	NF >11	NF >11 CF+	NF >11	CF 10.0	AF 6.0	CF 5.5	CF 7.0	CF >11	CF >11	NF 11 SF +	NF >11	NF 11 SF +	NF >11	CF 11.0	CF 9.0	CF 10.0	NF >11	NF >11 CF +	NF >11	CF 10.5	NF >11	NF >11 CF +	CF 10.25	NF > 11	NF >11 CF +	SF 6.0	SF 2.5	AF 5.5 SF 5.5	AF 6.0	CF 7.0	CF 8.5	CF 4.5	AF 4.0		(12) Same Failure (5) Diff. Failure			
	Results	Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Increased Pull Different Failure		Same Pull Same Failure		Increased Pull Different Failure		Decreased Pull Different Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Different Failure				4	9	4
Dow 795 non-porous	no primer	no primer		1200 OS		1200 OS		1200 OS		no primer		1200 OS		1200 OS		1200 OS		1200 OS		no primer		1200 OS		1200 OS		no primer		1200 OS		1200 OS		1200 OS		no primer		Dow 795				
	Failure	CF >11	NF >11 AF +	CF 10.75 SF start	AF 5.5	CF 5.0	AF 6.0	CF 6.5	CF 8.0	CF 6.0	CF 9.0	NF >11	NF >11	CF >11	AF 10.5	AF 7.25	NF >11	CF 3.5	AF 7.0	AF/CF 5.0	AF/CF 8.0	NF >11 CF +	NF >11	CF 10	CF >11	CF 8.5	NF >11 CF/AF +	CF >11 SF 5.0	SF 8.0	AF 4.25	AF 5.0	AF 5.0	CF 7.0	CF 8.0	AF 8.0		(8) Same Failure (9) Diff. Failure			
	Results	Same Pull Different Failure		Decreased Pull Different Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Decreased Pull Different Failure		Increased Pull Different Failure		Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Same Pull Different Failure				11	4	2
Dow 758	no primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Dow 758				
	Failure	CF 9.25	NF >11.0	CF 6.5	AF 9.0	AF 5.5 CF 5.5	AF 6.0	AF 4.25	AF 8.5	CF 6.0	CF 10 AF start	CF >11	NF 11.0 AF+	CF 8.75	AF 10.25	AF 6.0	AF 8.0	AF 9.0	AF 10.0	AF 6.5	AF 10.0	AF 9.25	CF >11	NF >11 CF+	NF >11 CF+	CF 6.25	AF 10.0	CF 7.0	SF 6.0	CF 4.25	CF 9.5	AF 8.0	AF 6.5	CF >11	CF 7.5		(10) Same Failure (7) Diff. Failure			
	Results	Increased Pull Different Failure		Increased Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Different Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Same Pull Same Failure		Increased Pull Different Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Same Failure				11	3	3
Dow C.W.S.	Primer	no primer		1200 OS		1200 OS		1200 OS		no primer		1200 OS		1200 OS		1200 OS		1200 OS		no primer		1200 OS		1200 OS		no primer		1200 OS		1200 OS		1200 OS		no primer		Dow CWS				
	Failure	NF >11	NF >11 CF+	AF 8.5	CF 9.5	AF 5.0 CF 5.0	AF 7.0	AF 7.0	CF 8.0	CF 4.0	AF 6.0	AF/SF >11	AF 10.0	CF 10	SF 10.0	CF 6.25	CF 9.5	AF 7.0 CF 7.0	AF 9.25	AF 8.0	AF 5.5	NF >11 CF +	AF 6.5	NF >11	NF >11 CF+	NF >11	NF >11	SF 5.5	SF 9.0	AF 4.25	AF 5.0	CF 5.0	AF 6.0	AF 11	CF 7.5		(10) Same Failure (7) Diff. Failure			
	Results	Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Different Failure		Increased Pull Different Failure		Decreased Pull Same Failure		Same Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Decreased Pull Different Failure				9	4	4
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Spectrem 1				
	Failure	AF 7.5	AF 10.0	AF 7.5	AF 5.0	AF 7.0	AF 6.0	CF 9.5	AF 7.0	CF 5.0	AF 6.0	AF 6.75	AF 8.0	CF 6.25	AF 10.0	AF 7.5	CF 7.5	NF >11	AF 8.5	AF 6.0	AF 9.0	AF 7.25	NF >11 AF/CF+	AF 7.0	AF 10.	NF 10.0 CF +	AF 7.5	NF >11 AF +	NF >11	CF 7.5	CF 8.0	CF 5.0	AF 4.75 CF start	CF 3.25	AF 4.0		(10) Same Failure (7) Diff. Failure			
	Results	Increased Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Different Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Different Failure		Same Pull Different Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure				9	4	4
STPes:																																								
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Sono 150				
	Failure	CF 6.25	NF >11.0	CF 8.25	CF 8.5	AF 8.5	CF 7.75	CF 3.5	CF 6.0	CF 7.0	CF 8.5	CF 6.5	CF/AF 8.5	CF 7.25	CF 11.0	AF/CF 5.75	AF/CF 7.0	CF 7.0	CF 10.25	CF 6.75	CF 8.5	NF >11 CF +	CF 11.0	CF 6.0	CF 8.0	CF 8.0	CF 10.5	CF 9.0	SF 3.5	CF 4.0	CF 9.5	CF 5.0	CF 5.0 AF 4.75	CF 2.5	CF 3.0		(14) Same Failure (3) Diff. Failure			
	Results	Increased Pull Different Failure		Same Pull Same Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure				11	4	2
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		ChemLinkM1				
	Failure	NF >11	NF >11	CF 7.0	AF 2.5	CF 11.0	CF 10.0	CF 5.5	CF 6.0	CF 8.5	CF 11.0	CF 8.75	CF 10.5	CF 9.0	CF >11.0	CF >11	CF >11	CF 10.0	CF 10.5	CF 8.0	CF >11	CF 8.75	AF 10.0 CF+	AF/CF 9.5	CF 10.5	NF 11.0 CF +	CF 11.0	SF 4.0	SF 6.5	AF 6.0 SF 6.25	SF 7.0	CF 10	CF 9.0	CF 7.0	CF 7.0		(16) Same Failure (1) Diff. Failure			
	Results	Same Pull Same Failure		Decreased Pull Different Failure		Decreased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure				8	6	3
Elastomeric Polymers:																																								
Osi Quad	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		OSI Quad				
	Failure	CF 5.25	CF 3.25	CF 3.25	AF 6.0 CF+	CF 1.25	CF 3.0	CF 3.0	CF 2.5	CF 2.0	CF 2.0	AF 4.5	AF 3.5	AF 4.0	CF 2.5	CF 1.5	CF 1.25	CF 2.0	CF 3.5	CF .5	CF 3.0	CF 3.0	CF 2.0	CF 0.5	CF 3.5	CF 1.25	CF 2.0	CF 1.75	CF 3.0	CF 2.0	CF 2.5	CF 2.0	AF 2.75 CF start	CF 2.5	CF 3.5		(16) Same Failure (1) Diff. Failure			
	Results	Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure				9	4	4
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		OSI Low VOC				
	Failure	CF 5.0	CF 3.0	too soft to pull	CF 1.25	CF 2.25	CF 3.0	CF 3.0	CF 1.75	CF 1.0	CF 3.0	CF 3.0	CF 2.0	CF 2.5	AF/CF 2.0	CF .25	CF 2.5	CF 1.0	CF 2.75	CF 1.0	CF 4.25	CF 2.0	CF 1.0	too soft to pull	CF 2.0	too soft to pull	CF 0.5	CF 1.5	CF 6.0	CF 2.0	CF 2.5	AF 2.0 CF2.5	AF/CF 2.25	CF 2.5 AF 2.5	AF 3.0		(17) Same Failure (0) Diff. Failure			
	Results	Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure				8	5	4
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Tremco 830				
	Failure	AF 3.75	AF 4.25	CF 2.0	AF/CF 6.0+	CF 3.25	CF 5.25	AF 3.75	CF 5.0	CF 2.5	CF 4.0	CF 4.5	CF 6.0	CF 5.0	SF/AF 6.5	CF 1.5	CF 6.5	CF 1.75	CF 7.25	CF 2.0	CF 4.5	CF 1.5	CF 4.25	CF 1.0	CF/AF 4.0	CF 1.0	CF 1.25	CF 2.0	CF 1.0	AF 3.0	CF 6.0	CF 3.5 AF 3.5	CF 4.75	CF 3.0	AF 3.5		(13) Same Failure (4) Diff. Failure			
	Results	Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Different Failure				14	2	1
Polyurethanes:																																								
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Vulkem 116				
	Failure	AF 6.0	AF 4.25	AF 5.0	AF 8.0	CF >11	CF 9.5	AF 3.75 CF 3.75	CF >11	AF 3.0	AF 4.0	NF >11 less at ink	NF >11 AF at ink	NF 11 SF +	SF 10.0	NF >11	AF 6.5	NF >11	NF >11	AF 4.0	AF 6.5	AF 9.0 varies w/ ink	AF 9.5	NF >11 AF+	NF >11 AF+	AF 3.0	AF 3.0	SF 5.25	SF 7.0	AF/CF SUB 8.0	NF 11 SF start	SF 6.5 CF 6.5	CF 8.0 SF at tab	AF 2.0	AF 2.5		(15) Same Failure (2) Diff. Failure			
	Results	Decreased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Different Failure		Decreased Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure				8	5	4
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Dymonic 100				
	Failure	AF 4.0	AF 4.25	NF >11 SF/CF +	NF >11	CF >11	NF 11 CF+	CF 6.25	SF/AF 10.0	AF 1.5	AF 4.0	NF >11	NF >11 AF at ink	SF 10	SF 10.5	NF >11	NF >11	NF >11	NF >11	AF 3.25	AF 2.0	NF >11 AF +	NF >11	NF >11	NF >11	AF 2.25	AF 2.75	SF 6.5	NF >11	SF >11	NF 11	CF 11.25	SF 9.5	AF 3.0	AF 2.5		(13) Same Failure (4) Diff. Failure			
	Results	Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Same Pull Different Failure		Decreased Pull Different Failure		Increased Pull Different Failure				4	11	2
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Sikaflex 15LM				
	Failure	AF 11	NF >11 AF/CF+	AF 11.0	NF >11 CF+	AF 5.5	NF 11 CF +	AF 5.25	CF >11	AF 8.0	NF 11.0 CF +	NF >11	AF 10.75 at ink	NF 11 SF +	SF 10.0	NF >11	NF >11	NF >11 CF+	NF >11	AF 11.0	NF >11	AF 4.5	AF 7.0 varies w ink	AF 10.5	AF >11	AF 3.25	AF 7.25	SF 3.75	SF >11	CF >11	CF 10.5	CF 10	SF 9.0 AF 11.0	AF 10.5	AF 7.5		(9) Same Failure (8) Diff. Failure			
	Results	Same Pull Same Failure		Same Pull Different Failure		Increased Pull Different Failure		Increased Pull Different Failure		Increased Pull Different Failure		Same Pull Different Failure		Decreased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Different Failure		Increased Pull Different Failure		Increased Pull Different Failure		Increased Pull Different Failure		Increased Pull Different Failure		Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Different Failure				9	7	1
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		ChemCalk				
	Failure	NF >11	NF >11	AF 6.0	AF 5.25	CF 7.25	CF 7.5	AF 4.5	SF 10.25	CF 11.0	AF 10.5	NF >11	AF 10.75 at ink	SF 8.5	SF 9.0	AF 10.25 1/2 bd	NF >11	AF >11	AF 11	AF 11.0 CF 11.0	NF >11 CF+	AF 9.75	NF >11	NF >11 AF/CF +	NF >11 AF+	NF 11.0 CF+	NF >11	SF 7.25	SF 6.0	AF 9.0	SF 9.0	CF 11.0	CF 8.5	AF 9.0	CF 5.0 AF 5.0		(11) Same Failure (5) Diff. Failure			
	Results	Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Decreased Pull Different Failure		Same Pull Different Failure		Same Pull Same Failure		Increased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Different Failure		Decreased Pull Same Failure		Decreased Pull Same Failure				3	9	5
																																				TOTAL		126	84	45

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - SAMs, Pull Strengths

Sealant Pull-Test Results 2013		WX		WX		WX		WX		WX	
SEALANTS	SUBSTRATES	Date: 7/22/13 Protecto Wrap PS 45		Date: 7/22/13 Protecto Wrap PW 100/40		Date: 7/15/13 Waterblock 40 Mil		Date:7/15/13 Waterblock High Temp - 40 Mil		Date: 7/15/13 Waterblock Foil Face - 40 Mil	
	Pull Test Day:	7/31/13	8/9/13	7/29/13	8/9/13	7/22/13	7/29/13	7/22/13	7/29/13	7/22/13	7/29/13
Silicones:											
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	CF 5.0	CF 7.25	CF 6.25	AF 6.0	CF 4.0	CF 4.25	CF 3.25	CF 4.0	AF 3.0 CF 3.0	CF 2.5
Dow 791	Primer	no primer		1200 OS		1200 OS		1200 OS		no primer	
	Failure	NF 11	NF >11	NF >11 CF+	NF >11	CF 10.0	AF 6.0	CF 5.5	CF 7.0	CF >11	CF >11
Dow 795 non-porous	no primer	no primer		1200 OS		1200 OS		1200 OS		no primer	
	Failure	CF >11	NF >11 AF +	CF 10.75 SF start	AF 5.5	CF 5.0	AF 6.0	CF 6.5	CF 8.0	CF 6.0	CF 9.0
Dow 758	no primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 9.25	NF >11.0	CF 6.5	AF 9.0	AF 5.5 CF 5.5	AF 6.0	AF 4.25	AF 8.5	CF 6.0	CF 10 AF start
Dow C.W.S.	Primer	no primer		1200 OS		1200 OS		1200 OS		no primer	
	Failure	NF >11	NF >11 CF+	AF 8.5	CF 9.5	AF 5.0 CF 5.0	AF 7.0	AF 7.0	CF 8.0	CF 4.0	AF 6.0
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 7.5	AF 10.0	AF 7.5	AF 5.0	AF 7.0	AF 6.0	CF 9.5	AF 7.0	CF 5.0	AF 6.0
STPes:											
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 6.25	NF >11.0	CF 8.25	CF 8.5	AF 8.5	CF 7.75	CF 3.5	CF 6.0	CF 7.0	CF 8.5
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11	CF 7.0	AF 2.5	CF 11.0	CF 10.0	CF 5.5	CF 6.0	CF 8.5	CF 11.0
Elastomeric Polymers:											
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 5.25	CF 3.25	CF 3.25	AF 6.0 CF+	CF 1.25	CF 3.0	CF 3.0	CF 2.5	CF 2.0	CF 2.0
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 5.0	CF 3.0	too soft to pull	CF 1.25	CF 2.25	CF 3.0	CF 3.0	CF 1.75	CF 1.0	CF 3.0
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 3.75	AF 4.25	CF 2.0	AF/CF 6.0+	CF 3.25	CF 5.25	AF 3.75	CF 5.0	CF 2.5	CF 4.0
Polyurethanes:											
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 6.0	AF 4.25	AF 5.0	AF 8.0	CF >11	CF 9.5	AF 3.75 CF 3.75	CF >11	AF 3.0	AF 4.0
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 4.0	AF 4.25	NF >11 SF/CF +	NF >11	CF >11	NF 11 CF+	CF 6.25	SF/AF 10.0	AF 1.5	AF 4.0
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 11	NF >11 AF/CF+	AF 11.0	NF >11 CF+	AF 5.5	NF 11 CF +	AF 5.25	CF >11	AF 8.0	NF 11.0 CF +
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11	AF 6.0	AF 5.25	CF 7.25	CF 7.5	AF 4.5	SF 10.25	CF 11.0	AF 10.5

Sealant Pull-Test Results 2013		AX		AX		AX		AX		AX	
SEALANTS	SUBSTRATES	Date: 7/22/13 Fortifiber Fortiflash - 40 mil		Date: 7/22/13 Fortifiber Fortiflash - Butyl		Date: 7/17/13 Grace Vycor V40		Date: 7/17/13 Grace Vycor Plus		Date: 7/17/13 Grace Vycor Aluminum Flashing	
	Pull Test Day:	7/31/13	8/9/13	7/31/13	8/9/13	7/24/13	7/31/13	7/24/13	7/31/13	7/24/13	7/31/13
Silicones:											
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	CF 5.25	CF 5.75	CF 3.25	CF 5.25	AF 2.5	AF 5.25	CF 4.0	CF 4.5	AF 3.25	AF 4.0
Dow 791	Primer	1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	NF 11 SF +	NF >11	NF 11 SF +	NF >11	CF 11.0	CF 9.0	CF 10.0	NF >11	NF >11 CF +	NF >11
Dow 795 non-porous	no primer	1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	NF >11	NF >11	CF >11	AF 10.5	AF 7.25	NF >11	CF 3.5	AF 7.0	AF/CF 5.0	AF/CF 8.0
Dow 758	no primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF >11	NF 11.0 AF+	CF 8.75	AF 10.25	AF 6.0	AF 8.0	AF 9.0	AF 10.0	AF 6.5	AF 10.0
Dow C.W.S.	Primer	1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	AF/SF >11	AF 10.0	CF 10	SF 10.0	CF 6.25	CF 9.5	AF 7.0 CF 7.0	AF 9.25	AF 8.0	AF 5.5
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 6.75	AF 8.0	CF 6.25	AF 10.0	AF 7.5	CF 7.5	NF >11	AF 8.5	AF 6.0	AF 9.0
STPes:											
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 6.5	CF/AF 8.5	CF 7.25	CF 11.0	AF/CF 5.75	AF/CF 7.0	CF 7.0	CF 10.25	CF 6.75	CF 8.5
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 8.75	CF 10.5	CF 9.0	CF >11.0	CF >11	CF >11	CF 10.0	CF 10.5	CF 8.0	CF >11
Elastomeric Polymers:											
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 4.5	AF 3.5	AF 4.0	CF 2.5	CF 1.5	CF 1.25	CF 2.0	CF 3.5	CF .5	CF 3.0
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 3.0	CF 2.0	CF 2.5	AF/CF 2.0	CF .25	CF 2.5	CF 1.0	CF 2.75	CF 1.0	CF 4.25
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 4.5	CF 6.0	CF 5.0	SF/AF 6.5	CF 1.5	CF 6.5	CF 1.75	CF 7.25	CF 2.0	CF 4.5
Polyurethanes:											
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11 less at ink	NF >11 AF at ink	NF 11 SF +	SF 10.0	NF >11	AF 6.5	NF >11	NF >11	AF 4.0	AF 6.5
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11 AF at ink	SF 10	SF 10.5	NF >11	NF >11	NF >11	NF >11	AF 3.25	AF 2.0
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	AF 10.75 at ink	NF 11 SF +	SF 10.0	NF >11	NF >11	NF >11 CF+	NF >11	AF 11.0	NF >11
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	AF 10.75 at ink	SF 8.5	SF 9.0	AF 10.25 1/2 beAF	NF >11	AF >11	AF 11	AF 11.0 CF 11.0	NF >11 CF+

Sealant Pull-Test Results 2013		WX		WX		WX		WX		WX	
SEALANTS	SUBSTRATES	Date: 7/22/13 Henry Blueskin SA		Date: 7/22/13 Henry Blueskin SA LT		Date: 7/22/13 Henry Foilskin		Dtae 7/17/13 Dupont StraightFlash		Date: 7/15/13 Dupont FlexWrap NF	
	Pull Test Day:	7/29/13	8/9/13	7/29/13	8/9/13	7/29/13	8/9/13	7/24/13	7/31/13	7/22/13	7/29/13
Silicones:											
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	CF 9.0	CF 7.5	CF 6.0	CF 5.0	CF 4.25	CF 5.5 AF +	AF 5.25	AF 5.0	CF 3.0	AF 4.0
Dow 791	Primer	1200 OS		1200 OS		no primer		1200 OS		1200 OS	
	Failure	CF 10.5	NF >11	NF >11 CF +	CF 10.25	NF > 11	NF >11 CF +	SF 6.0	SF 2.5	AF 5.5 SF 5.5	AF 6.0
Dow 795 non-porous	no primer	1200 OS		1200 OS		no primer		1200 OS		1200 OS	
	Failure	NF >11 CF +	NF >11	CF 10	CF >11	CF 8.5	NF >11 CF/AF +	CF >11 SF 5.0	SF 8.0	AF 4.25	AF 5.0
Dow 758	no primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 9.25	CF >11	NF >11 CF+	NF >11 CF+	CF 6.25	AF 10.0	CF 7.0	SF 6.0	CF 4.25	CF 9.5
Dow C.W.S.	Primer	1200 OS		1200 OS		no primer		1200 OS		1200 OS	
	Failure	NF >11 CF +	AF 6.5	NF >11	NF >11 CF+	NF >11	NF >11	SF 5.5	SF 9.0	AF 4.25	AF 5.0
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 7.25	NF >11 AF/CF+	AF 7.0	AF 10.	NF 10.0 CF +	AF 7.5	NF >11 AF +	NF >11	CF 7.5	CF 8.0
STPes:											
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11 CF +	CF 11.0	CF 6.0	CF 8.0	CF 8.0	CF 10.5	CF 9.0	SF 3.5	CF 4.0	CF 9.5
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 8.75	AF 10.0 CF+	AF/CF 9.5	CF 10.5	NF 11.0 CF +	CF 11.0	SF 4.0	SF 6.5	AF 6.0 SF 6.25	SF 7.0
Elastomeric Polymers:											
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 3.0	CF 2.0	CF 0.5	CF 3.5	CF 1.25	CF 2.0	CF 1.75	CF 3.0	CF 2.0	CF 2.5
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 2.0	CF 1.0	too soft to pull	CF 2.0	too soft to pull	CF 0.5	CF 1.5	CF 6.0	CF 2.0	CF 2.5
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 1.5	CF 4.25	CF 1.0	CF/AF 4.0	CF 1.0	CF 1.25	CF 2.0	CF 1.0	AF 3.0	CF 6.0
Polyurethanes:											
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 9.0 varies w/ ink	AF 9.5	NF >11 AF+	NF >11 AF+	AF 3.0	AF 3.0	SF 5.25	SF 7.0	AF/CF SUB 8.0	NF 11 SF start
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11 AF +	NF >11	NF >11	NF >11	AF 2.25	AF 2.75	SF 6.5	NF >11	SF >11	NF 11
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 4.5	AF 7.0 varies w ink	AF 10.5	AF >11	AF 3.25	AF 7.25	SF 3.75	SF >11	CF >11	CF 10.5
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 9.75	NF >11	NF >11 AF/CF +	NF >11 AF+	NF 11.0 CF+	NF >11	SF 7.25	SF 6.0	AF 9.0	SF 9.0

Sealant Pull-Test Results 2013		WX		WX	
SEALANTS	SUBSTRATES	Date: 7/15/13 OSI TeQ Flash		Date: 7/8/13 OSI TeQ Flash Tape (FF)	
	Pull Test Day:	7/22/13	7/29/13	7/19/13	7/22/13
Silicones:					
Dow 790 porous	Primer	1200 OS		1200 OS	
	Failure	CF 2.75	CF 4.0	CF 2.5	CF 2.5
Dow 791	Primer	1200 OS		no primer	
	Failure	CF 7.0	CF 8.5	CF 4.5	AF 4.0
Dow 795 non-porous	no primer	1200 OS		no primer	
	Failure	AF 5.0	CF 7.0	CF 8.0	AF 8.0
Dow 758	no primer	no primer		no primer	
	Failure	AF 8.0	AF 6.5	CF >11	CF 7.5
Dow C.W.S.	Primer	1200 OS		no primer	
	Failure	CF 5.0	AF 6.0	AF 11	CF 7.5
Spectrem 1	Primer	no primer		no primer	
	Failure	CF 5.0	AF 4.75 CF start	CF 3.25	AF 4.0
STPes:					
Sonolastic 150 VLM	Primer	no primer		no primer	
	Failure	CF 5.0	CF 5.0 AF 4.75	CF 2.5	CF 3.0
Chem Link M1	Primer	no primer		no primer	
	Failure	CF 10	CF 9.0	CF 7.0	CF 7.0
Elastomeric Polymers:					
OSI Quad Low VOC	Primer	no primer		no primer	
	Failure	CF 2.0	AF 2.75 CF start	CF 2.5	CF 3.5
OSI Quad Low VOC	Primer	no primer		no primer	
	Failure	AF 2.0 CF2.5	AF/CF 2.25	CF 2.5 AF 2.5	AF 3.0
Tremco 830	Primer	no primer		no primer	
	Failure	CF 3.5 AF 3.5	CF 4.75	CF 3.0	AF 3.5
Polyurethanes:					
Tremco Vulkem 116	Primer	no primer		no primer	
	Failure	SF 6.5 CF 6.5	CF 8.0 SF at tab	AF 2.0	AF 2.5
Tremco Dymonic 100	Primer	no primer		no primer	
	Failure	CF 11.25	SF 9.5	AF 3.0	AF 2.5
Sikaflex 15 LM	Primer	no primer		no primer	
	Failure	CF 10	SF 9.0 AF 11.0	AF 10.5	AF 7.5
Chem-Calk 2000	Primer	no primer		no primer	
	Failure	CF 11.0	CF 8.5	AF 9.0	CF 5.0 AF 5.0

Color Scale:
- 0 to <3
- 3 to <6
- 6 to <9
- 9 to 11

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - SAMs, Foil & Polyethylene Faced Comparison, Pull Strengths

Sealant Pull-Test Results 2013

SEALANTS	SUBSTRATES	Date: 7/22/13 Protecto Wrap PS 45		Date: 7/15/13 Waterblock Foil Face - 40 Mil		Date: 7/17/13 Grace Vycor Aluminum Flashing		Date: 7/22/13 Henry Foilskin		Date: 7/8/13 OSI TeQ Flash Tape (FF)		Date: 7/22/13 Protecto Wrap PW 100/40		Date: 7/15/13 Waterblock 40 Mil		Date:7/15/13 Waterblock High Temp - 40 Mil	
		WX		WX		AX		WX		WX		WX		WX		WX	
	Pull Test Day:	7/31/13	8/9/13	7/22/13	7/29/13	7/24/13	7/31/13	7/29/13	8/9/13	7/19/13	7/22/13	7/29/13	8/9/13	7/22/13	7/29/13	7/22/13	7/29/13
Silicones:																	
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	CF 5.0	CF 7.25	AF 3.0 CF 3.0	CF 2.5	AF 3.25	AF 4.0	CF 4.25	CF 5.5 AF +	CF 2.5	CF 2.5	CF 6.25	AF 6.0	CF 4.0	CF 4.25	CF 3.25	CF 4.0
Dow 791	Primer	no primer		no primer		no primer		no primer		no primer		1200 OS		1200 OS		1200 OS	
	Failure	NF 11	NF >11	CF >11	CF >11	NF >11 CF +	NF >11	NF > 11	NF >11 CF +	CF 4.5	AF 4.0	NF >11 CF+	NF >11	CF 10.0	AF 6.0	CF 5.5	CF 7.0
Dow 795 non-porous	no primer	no primer		no primer		no primer		no primer		no primer		1200 OS		1200 OS		1200 OS	
	Failure	CF >11	NF >11 AF +	CF 6.0	CF 9.0	AF/CF 5.0	AF/CF 8.0	CF 8.5	NF >11 CF/AF +	CF 8.0	AF 8.0	CF 10.75 SF start	AF 5.5	CF 5.0	AF 6.0	CF 6.5	CF 8.0
Dow 758	no primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 9.25	NF >11.0	CF 6.0	CF 10 AF start	AF 6.5	AF 10.0	CF 6.25	AF 10.0	CF >11	CF 7.5	CF 6.5	AF 9.0	AF 5.5 CF 5.5	AF 6.0	AF 4.25	AF 8.5
Dow C.W.S.	Primer	no primer		no primer		no primer		no primer		no primer		1200 OS		1200 OS		1200 OS	
	Failure	NF >11	NF >11 CF+	CF 4.0	AF 6.0	AF 8.0	AF 5.5	NF >11	NF >11	AF 11	CF 7.5	AF 8.5	CF 9.5	AF 5.0 CF 5.0	AF 7.0	AF 7.0	CF 8.0
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 7.5	AF 10.0	CF 5.0	AF 6.0	AF 6.0	AF 9.0	NF 10.0 CF +	AF 7.5	CF 3.25	AF 4.0	AF 7.5	AF 5.0	AF 7.0	AF 6.0	CF 9.5	AF 7.0
STPes:																	
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 6.25	NF >11.0	CF 7.0	CF 8.5	CF 6.75	CF 8.5	CF 8.0	CF 10.5	CF 2.5	CF 3.0	CF 8.25	CF 8.5	AF 8.5	CF 7.75	CF 3.5	CF 6.0
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11	CF 8.5	CF 11.0	CF 8.0	CF >11	NF 11.0 CF +	CF 11.0	CF 7.0	CF 7.0	CF 7.0	AF 2.5	CF 11.0	CF 10.0	CF 5.5	CF 6.0
Elastomeric Polymers:																	
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 5.25	CF 3.25	CF 2.0	CF 2.0	CF .5	CF 3.0	CF 1.25	CF 2.0	CF 2.5	CF 3.5	CF 3.25	AF 6.0 CF+	CF 1.25	CF 3.0	CF 3.0	CF 2.5
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 5.0	CF 3.0	CF 1.0	CF 3.0	CF 1.0	CF 4.25	too soft to pull	CF 0.5	CF 2.5 AF 2.5	AF 3.0	too soft to pull	CF 1.25	CF 2.25	CF 3.0	CF 3.0	CF 1.75
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 3.75	AF 4.25	CF 2.5	CF 4.0	CF 2.0	CF 4.5	CF 1.0	CF 1.25	CF 3.0	AF 3.5	CF 2.0	AF/CF 6.0+	CF 3.25	CF 5.25	AF 3.75	CF 5.0
Polyurethanes:																	
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 6.0	AF 4.25	AF 3.0	AF 4.0	AF 4.0	AF 6.5	AF 3.0	AF 3.0	AF 2.0	AF 2.5	AF 5.0	AF 8.0	CF >11	CF 9.5	AF 3.75 CF 3.75	CF >11
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 4.0	AF 4.25	AF 1.5	AF 4.0	AF 3.25	AF 2.0	AF 2.25	AF 2.75	AF 3.0	AF 2.5	NF >11 SF/CF +	NF >11	CF >11	NF 11 CF+	CF 6.25	SF/AF 10.0
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 11	NF >11 AF/CF+	AF 8.0	NF 11.0 CF +	AF 11.0	NF >11	AF 3.25	AF 7.25	AF 10.5	AF 7.5	AF 11.0	NF >11 CF+	AF 5.5	NF 11 CF +	AF 5.25	CF >11
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11	CF 11.0	AF 10.5	AF 11.0 CF 11.0	NF >11 CF+	NF 11.0 CF+	NF >11	AF 9.0	CF 5.0 AF 5.0	AF 6.0	AF 5.25	CF 7.25	CF 7.5	AF 4.5	SF 10.25

SEALANTS	SUBSTRATES	Date: 7/22/13 Fortifiber Fortiflash - 40 mil		Date: 7/22/13 Fortifiber Fortiflash - Butyl		Date: 7/17/13 Grace Vycor V40		Date: 7/17/13 Grace Vycor Plus		Date: 7/22/13 Henry Blueskin SA		Date: 7/22/13 Henry Blueskin SA LT		Dtae 7/17/13 Dupont StraightFlash		Date: 7/15/13 Dupont FlexWrap NF		Date: 7/15/13 OSI TeQ Flash	
		AX		AX		AX		AX		WX		WX		WX		WX		WX	
	Pull Test Day:	7/31/13	8/9/13	7/31/13	8/9/13	7/24/13	7/31/13	7/24/13	7/31/13	7/29/13	8/9/13	7/29/13	8/9/13	7/24/13	7/31/13	7/22/13	7/29/13	7/22/13	7/29/13
Silicones:																			
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	CF 5.25	CF 5.75	CF 3.25	CF 5.25	AF 2.5	AF 5.25	CF 4.0	CF 4.5	CF 9.0	CF 7.5	CF 6.0	CF 5.0	AF 5.25	AF 5.0	CF 3.0	AF 4.0	CF 2.75	CF 4.0
Dow 791	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	NF 11 SF +	NF >11	NF 11 SF +	NF >11	CF 11.0	CF 9.0	CF 10.0	NF >11	CF 10.5	NF >11	NF >11 CF +	CF 10.25	SF 6.0	SF 2.5	AF 5.5 SF 5.5	AF 6.0	CF 7.0	CF 8.5
Dow 795 non-porous	no primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	NF >11	NF >11	CF >11	AF 10.5	AF 7.25	NF >11	CF 3.5	AF 7.0	NF >11 CF +	NF >11	CF 10	CF >11	CF >11 SF 5.0	SF 8.0	AF 4.25	AF 5.0	AF 5.0	CF 7.0
Dow 758	no primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF >11	NF 11.0 AF+	CF 8.75	AF 10.25	AF 6.0	AF 8.0	AF 9.0	AF 10.0	AF 9.25	CF >11	NF >11 CF+	NF >11 CF+	CF 7.0	SF 6.0	CF 4.25	CF 9.5	AF 8.0	AF 6.5
Dow C.W.S.	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	AF/SF >11	AF 10.0	CF 10	SF 10.0	CF 6.25	CF 9.5	AF 7.0 CF 7.0	AF 9.25	NF >11 CF +	AF 6.5	NF >11	NF >11 CF+	SF 5.5	SF 9.0	AF 4.25	AF 5.0	CF 5.0	AF 6.0
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 6.75	AF 8.0	CF 6.25	AF 10.0	AF 7.5	CF 7.5	NF >11	AF 8.5	AF 7.25	NF >11 AF/CF+	AF 7.0	AF 10.	NF >11 AF +	NF >11	CF 7.5	CF 8.0	CF 5.0	AF 4.75 CF start
STPes:																			
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 6.5	CF/AF 8.5	CF 7.25	CF 11.0	AF/CF 5.75	AF/CF 7.0	CF 7.0	CF 10.25	NF >11 CF +	CF 11.0	CF 6.0	CF 8.0	CF 9.0	SF 3.5	CF 4.0	CF 9.5	CF 5.0	CF 5.0 AF 4.75
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 8.75	CF 10.5	CF 9.0	CF >11.0	CF >11	CF >11	CF 10.0	CF 10.5	CF 8.75	AF 10.0 CF+	AF/CF 9.5	CF 10.5	SF 4.0	SF 6.5	AF 6.0 SF 6.25	SF 7.0	CF 10	CF 9.0
Elastomeric Polymers:																			
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 4.5	AF 3.5	AF 4.0	CF 2.5	CF 1.5	CF 1.25	CF 2.0	CF 3.5	CF 3.0	CF 2.0	CF 0.5	CF 3.5	CF 1.75	CF 3.0	CF 2.0	CF 2.5	CF 2.0	AF 2.75 CF start
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 3.0	CF 2.0	CF 2.5	AF/CF 2.0	CF .25	CF 2.5	CF 1.0	CF 2.75	CF 2.0	CF 1.0	too soft to pull	CF 2.0	CF 1.5	CF 6.0	CF 2.0	CF 2.5	AF 2.0 CF2.5	AF/CF 2.25
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 4.5	CF 6.0	CF 5.0	SF/AF 6.5	CF 1.5	CF 6.5	CF 1.75	CF 7.25	CF 1.5	CF 4.25	CF 1.0	CF/AF 4.0	CF 2.0	CF 1.0	AF 3.0	CF 6.0	CF 3.5 AF 3.5	CF 4.75
Polyurethanes:																			
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11 less at ink	NF >11 AF at ink	NF 11 SF +	SF 10.0	NF >11	AF 6.5	NF >11	NF >11	AF 9.0 varies w/ ink	AF 9.5	NF >11 AF+	NF >11 AF+	SF 5.25	SF 7.0	AF/CF SUB 8.0	NF 11 SF start	SF 6.5 CF 6.5	CF 8.0 SF at tab
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11 AF at ink	SF 10	SF 10.5	NF >11	NF >11	NF >11	NF >11	NF >11 AF +	NF >11	NF >11	NF >11	SF 6.5	NF >11	SF >11	NF 11	CF 11.25	SF 9.5
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	AF 10.75 at ink	NF 11 SF +	SF 10.0	NF >11	NF >11	NF >11 CF+	NF >11	AF 4.5	AF 7.0 varies w ink	AF 10.5	AF >11	SF 3.75	SF >11	CF >11	CF 10.5	CF 10	SF 9.0 AF 11.0
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	NF >11	AF 10.75 at ink	SF 8.5	SF 9.0	AF 10.25 1/2 beAF	NF >11	AF >11	AF 11	AF 9.75	NF >11	NF >11 AF/CF +	NF >11 AF+	SF 7.25	SF 6.0	AF 9.0	SF 9.0	CF 11.0	CF 8.5

Color Scale:
- 0 to <3
- 3 to <6
- 6 to <9
- 9 to 11

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - WRBs, Seven to 14-Day Adhesion Test Pulls

Sealant Pull-Test Results 2013		WX		WX		WX		AX		WX		WX		WX		WX		WX		AX		AX					
SEALFNTS	SUBSTRATES	Date: 7/3/13 DuPont Tyvek Commercial Wrap D		Date: 7/3/13 DuPont Tyvek Commercial Wrap		Date: 7/3/13 Fortifiber WeatherSmart Commercial		Date: 7/8/13 Grace Perm-A-Barrier		Date: 7/8/13 Grace Perm-A-Barrier VPS		Date: 7/31/13 Prosoco Fast Flash		Date: 7/31/13 Prosoco R-Guard Cat 5		Date: 7/31/13 Sto CFrp. StoGuard Gold Coat		Date: 7/31/13 Henry Air-Bloc 33MR		Date: 7/31/13 Dow Defend Air 200		Date:8/13/13 BASF Enershield				Increased Strength	No StrengthChange	Decreased Strength
	Pull Test Day:	7/17/13	7/24/13	7/17/13	7/24/13	7/18/13	7/24/13	7/18/13	7/22/13	7/18/13	7/22/13	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13	8/21/13	8/30/13				
Silicones:																											
Dow 790	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer		no primer		no primer		no primer		no primer		no primer		Dow 790			
	Failure	AF .5	AF .75	AF .75	AF 1.0	AF 3.5	AF 3.5	CF 3.0	CF 5.0	AF .5	AF .75	CF 6.5	CF 6.5	AF 2.0	AF 2.0	CF 6.5	CF 5.0	CF 4.5	AF 4.5	AF 6.5	AF 5.0	CF 6.5	NF >6.5 CF+		(10) Same Failure (1) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Different Failure		Decreased Pull Same Failure		Same Pull Same Failure			1	8	2
Dow 791	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer		no primer		no primer		no primer		no primer		no primer		Dow 791			
	Failure	AF .25	AF .50	AF .25	AF <.5	SF 2.25	SF 1.75	NF >11	CF 3.0	AF .25	AF 0.0	SF 10.0	SF 8.0	AF 1.0	AF 1.5	NF >11.0	NF >11	NF >11 LF+	NF >11	LF 9.0	LF 8.0	NF > 11.0	NF >11.0		(10) Same Failure (1) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure			1	7	3
Dow 795	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer		no primer		no primer		no primer		no primer		no primer		Dow 795			
	Failure	AF <.5	AF .50	AF .5	AF .5	SF 3.0	SF 3.0	CF 7.0	AF 7.5	AF .25	AF<.25	AF 10.0	AF/SF 6.5	AF 1.25	AF 1.25	NF >11.0	NF >11	NF >11 LF+	NF >11	AF 2.5	AF 3.0	NF >11.0	NF >11.0		(10) Same Failure (1) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Different Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure			0	10	1
Dow 758	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Dow 758			
	Failure	SF 2.0	SF 7.0	SF 2.0	SF 2.5	SF 3.0	SF 4.0	AF 9.0	AF 9.0	SF 3.5 CF 4.0	SF 4.0	AF 6.0	AF 5.0	AF 1.5	AF 2.5	NF >11.0	NF >11	AF 8.0	AF 9.0	LF 9.0	NF >11	NF >11.0	NF >11.0		(10) Same Failure (1) Diff. Failure		
	Results	Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure			6	5	0
Dow C.W.S.	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer		no primer		no primer		no primer		no primer		no primer		Dow CWS			
	Failure	AF .25	AF .5	AF .5 1.0 @pt	AF .75 1.25 @pt	SF 2.5	SF 4.0	CF 6.0	AF 6.5	AF .5 AF 2 pt SF 3.0	AF 0.5 SF 2.25 @ink	SF 8.5	SF 7.5	AF 1.5	AF 1.0	NF >11.0	NF >11	AF 6.5 CF+	NF >11	AF 3.0	AF 3.75	NF >11.0	NF >11.0 SF+		(9) Same Failure (2) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure			3	7	1
Spectrem 1	Primer	not tested		not tested		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Spectrem 1			
	Failure					SF 4.0	SF 5.0	AF 6.5	AF 5.25	AF .75	AF .5	AF 7.0	AF 6.0	AF 1.0	AF 1.0	AF 9.0	AF 4.75	CF 10.0	NF >11	LF 7.0	LF >11	NF >11.0	NF >11.0		(8) Same Failure (1) Diff. Failure		
	Results					Increased Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure			3	3	3
STPes:																											
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Sonolastic 150			
	Failure	AF .75	AF 1.75	AF .75	AF .5	SF 2.5	SF 4.5	CF 6.0	CF 8.5	AF .75	AF <.5	SF 5.0	SF 4.5	CF 9.25	LF 8.5	CF 9.0	CF 8.5	CF 10.0	CF 8.0	LF 8.0	LF 7.5	LF 8.5	LF 7.5		(10) Same Failure (1) Diff. Failure		
	Results	Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure			3	5	3
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Chem Link M1			
	Failure	AF .25	AF .5	AF .25	AF .25	SF 3.25	SF 2.0	CF 9.0	AF 7.0	AF .25	AF 1.5	CF >11	CF 10.0	CF 7.25	LF 8.0	CF 8.0	CF >11	NF >11 CF+	NF >11	LF 4.0	LF 6.0	LF/SF 10.0	NF >11.0 LF+		(9) Same Failure (2) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure			6	2	3
Prosoco Air Dam	Primer	not tested		not tested		not tested		not tested		not tested		no primer		no primer		not tested		not tested		not tested		not tested		Prosoco AirDam			
	Failure											AF 8.5	CF 10.	AF 10.5	CF 6.0										(0) Same Failure (2) Diff. Failure		
	Results											Increased Pull Different Failure		Decreased Pull Different Failure											1	0	1
	CFmment											8/21/13	8/30/13	8/21/13	8/30/13												
Elastomeric Polymers:																											
Osi Quad	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Osi Quad			
	Failure	CF 1.75	CF 2.25	SF 2.0	SF 3.5	SF 2.75 CF 3	SF 4.0 CF 4.0	CF 3.25	AF 4.0 CF 4.0	CF 1.5	SF 2.5	AF 0.25	AF 0.25	AF 0.25	AF 0.5	CF 2.5	CF 2.5	CF 2.5	CF 2.0	AF 0.0	AF 0.25	AF 1.25	AF 2.0		(10) Same Failure (1) Diff. Failure		
	Results	Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure			6	5	0
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		OSI Low VOC			
	Failure	CF 3.0	CF 4.25	SF 2.0 CF 2.0	SF 4.75	SF 3.5 CF 4.0	unable to pull	CF 2.5	AF 3.5 CF 3.5	CF 2.0 SF 2.0	CF 3.5	AF 0.25	AF 0.25	AF 0.25	AF 0.5	CF 3.5	CF 4.0	CF 3.0	CF 2.5	AF 0.0	AF 0.0	CF 2.0	CF 4.5		(10) Same Failure (0) Diff. Failure		
	Results	Increased Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure			5	5	1
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		not tested		Tremco 830			
	Failure	SF 3.25	SF 4.0	SF 3.5	SF 1.5	SF 3 CF 5.75	SF 6.5	CF 5.5	CF 5.0 AF 5.0	CF 4.25	AF 4.0 SF 4.0	AF 0.0	AF 0.0	AF 0.0	AF 0.0	AF 1.5	AF 2.25	AF 4.0	AF 5.5	AF 0.0	AF 0.0				(9) Same Failure (1) Diff. Failure		
	Results	Increased Pull Same Failure		Decreased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure					4	5	1
Polyurethanes:																											
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Vulkem 116			
	Failure	AF .25	AF .5	AF .25	AF .5	SF 2.0	SF 5.0	AF 3.0	AF 4.5	AF .75	AF .5	AF 0.5	AF 1.0	AF 0.25	AF 0.25	AF 1.0	AF 1.0	LF 10.0	LF 9.0	AF 0.0	AF 0.0	CF 1.5	CF 1.5		(11) Same Failure (0) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure			2	8	1
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Dymonic 100			
	Failure	AF .5	AF .5	AF .5	AF .25	SF 2.0	SF 6.0	AF 2.5	AF 5.5	AF .75 SF .75	AF .25	AF >11	AF >11	AF 2.5	AF 1.5	NF >11.0	NF >11	NF >11	NF >11	AF 0.0	AF 0.0	NF >11.0 LF+	LF 7.5		(11) Same Failure (0) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure			2	7	2
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Sikaflex 15 LM			
	Failure	AF 1.0	AF 1.0	AF <.5 SF <.5	AF .5	SF 4.0	SF 3.0	CF >11	CF >11	AF .25	AF 0.0	NF >11 CF+	NF >11	AF 0.25	AF 0.5	AF 1.0	AF 1.25	AF 4.0	AF 3.0	AF 0.0	AF 0.0	AF 1.0	AF 1.5		(11) Same Failure (0) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure			2	9	0
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Chem-Calk			
	Failure	AF .25	AF 1.0	AF .25	AF .25	SF 2.5	SF 3.5	AF 6.5	AF 10.5	AF .5	AF .5	NF >11 SF+	LF 10.0	LF 6.0	LF 7.5	NF >11.0	NF >11	AF/LF 10.0	LF 10.0	LF 3.0	LF 6.25	LF 2.5	LF 4.5		(10) Same Failure (1) Diff. Failure		
	Results	Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure			6	4	1
																								TOTAL	51	90	23

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - WRBs, Pull Strengths

Sealant Pull-Test Results 2013		WX		WX		WX		AX		WX		WX	
SEALANTS	SUBSTRATES	Date: 7/3/13 DuPont Tyvek Comm. Wrap D		Date: 7/3/13 DuPont Tyvek Commercial Wrap		Date: 7/3/13 Fortifiber WeatherSmart Comm.		Date: 7/8/13 Grace Perm-A-Barrier		Date: 7/8/13 Grace Perm-A-Barrier VPS		Date: 7/31/13 Prosoco Fast Flash	
	Pull Test Day:	7/17/13	7/24/13	7/17/13	7/24/13	7/18/13	7/24/13	7/18/13	7/22/13	7/18/13	7/22/13	8/12/13	8/16/13
Silicones:													
Dow 790	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	AF .5	AF .75	AF .75	AF 1.0	AF 3.5	AF 3.5	CF 3.0	CF 5.0	AF .5	AF .75	CF 6.5	CF 6.5
Dow 791	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	AF .25	AF .50	AF .25	AF <.5	SF 2.25	SF 1.75	NF >11	CF 3.0	AF .25	AF 0.0	SF 10.0	SF 8.0
Dow 795	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	AF <.5	AF .50	AF .5	AF .5	SF 3.0	SF 3.0	CF 7.0	AF 7.5	AF .25	AF<.25	AF 10.0	AF/SF 6.5
Dow 758	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	SF 2.0	SF 7.0	SF 2.0	SF 2.5	SF 3.0	SF 4.0	AF 9.0	AF 9.0	SF 3.5 CF 4.0	SF 4.0	AF 6.0	AF 5.0
Dow C.W.S.	Primer	1200 OS		1200 OS		1200 OS		1200 OS		1200 OS		no primer	
	Failure	AF .25	AF .5	AF .5 1.0 @pt	AF .75 1.25 @pt	SF 2.5	SF 4.0	CF 6.0	AF 6.5	AF .5 AF 2 pt SF 3.0	AF 0.5 SF 2.25 @ink	SF 8.5	SF 7.5
Spectrem 1	Primer	not tested		not tested		no primer		no primer		no primer		no primer	
	Failure					SF 4.0	SF 5.0	AF 6.5	AF 5.25	AF .75	AF .5	AF 7.0	AF 6.0
STPes:													
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF .75	AF 1.75	AF .75	AF .5	SF 2.5	SF 4.5	CF 6.0	CF 8.5	AF .75	AF <.5	SF 5.0	SF 4.5
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF .25	AF .5	AF .25	AF .25	SF 3.25	SF 2.0	CF 9.0	AF 7.0	AF .25	AF 1.5	CF >11	CF 10.0
Prosoco Air Dam	Primer	not tested		not tested		not tested		not tested		not tested		no primer	
	Failure											AF 8.5	CF 10.
Elastomeric Polymers:													
Osi Quad	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 1.75	CF 2.25	SF 2.0	SF 3.5	SF 2.75 CF 3	SF 4.0 CF 4.0	CF 3.25	AF 4.0 CF 4.0	CF 1.5	SF 2.5	AF 0.25	AF 0.25
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	CF 3.0	CF 4.25	SF 2.0 CF 2.0	SF 4.75	SF 3.5 CF 4.0	unable to pull	CF 2.5	AF 3.5 CF 3.5	CF 2.0 SF 2.0	CF 3.5	AF 0.25	AF 0.25
Tremco 830	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	SF 3.25	SF 4.0	SF 3.5	SF 1.5	SF 3 CF 5.75	SF 6.5	CF 5.5	CF 5.0 AF 5.0	CF 4.25	AF 4.0 SF 4.0	AF 0.0	AF 0.0
Polyurethanes:													
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF .25	AF .5	AF .25	AF .5	SF 2.0	SF 5.0	AF 3.0	AF 4.5	AF .75	AF .5	AF 0.5	AF 1.0
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF .5	AF .5	AF .5	AF .25	SF 2.0	SF 6.0	AF 2.5	AF 5.5	AF .75 SF .75	AF .25	AF >11	AF >11
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF 1.0	AF 1.0	AF <.5 SF <.5	AF .5	SF 4.0	SF 3.0	CF >11	CF >11	AF .25	AF 0.0	NF >11 CF+	NF >11
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer		no primer	
	Failure	AF .25	AF 1.0	AF .25	AF .25	SF 2.5	SF 3.5	AF 6.5	AF 10.5	AF .5	AF .5	NF >11 SF+	LF 10.0

Sealant Pull-Test Results 2013		WX		WX		WX		AX		AX	
SEALANTS	SUBSTRATES	Date: 7/31/13 Prosoco R-Guard Cat 5		Date: 7/31/13 Sto Corp. StoGuard Gold Coat		Date: 7/31/13 Henry Air-Bloc 33MR		Date: 7/31/13 Dow Defend Air 200		Date: 8/13/13 BASF Enershield	
	Pull Test Day:	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13	8/21/13	8/30/13
Silicones:											
Dow 790	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 2.0	AF 2.0	CF 6.5	CF 5.0	CF 4.5	AF 4.5	AF 6.5	AF 5.0	CF 6.5	NF >6.5 CF+
Dow 791	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 1.0	AF 1.5	NF >11.0	NF >11	NF >11 LF+	NF >11	LF 9.0	LF 8.0	NF > 11.0	NF >11.0
Dow 795	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 1.25	AF 1.25	NF >11.0	NF >11	NF >11 LF+	NF >11	AF 2.5	AF 3.0	NF >11.0	NF >11.0
Dow 758	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 1.5	AF 2.5	NF >11.0	NF >11	AF 8.0	AF 9.0	LF 9.0	NF >11	NF >11.0	NF >11.0
Dow C.W.S.	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 1.5	AF 1.0	NF >11.0	NF >11	AF 6.5 CF+	NF >11	AF 3.0	AF 3.75	NF >11.0	NF >11.0 SF+
Spectrem 1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 1.0	AF 1.0	AF 9.0	AF 4.75	CF 10.0	NF >11	LF 7.0	LF >11	NF >11.0	NF >11.0
STPes:											
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 9.25	LF 8.5	CF 9.0	CF 8.5	CF 10.0	CF 8.0	LF 8.0	LF 7.5	LF 8.5	LF 7.5
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	CF 7.25	LF 8.0	CF 8.0	CF >11	NF >11 CF+	NF >11	LF 4.0	LF 6.0	LF/SF 10.0	NF >11.0 LF+
Prosoco Air Dam	Primer	no primer		not tested		not tested		not tested		not tested	
	Failure	AF 10.5	CF 6.0								
Elastomeric Polymers:											
Osi Quad	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 0.25	AF 0.5	CF 2.5	CF 2.5	CF 2.5	CF 2.0	AF 0.0	AF 0.25	AF 1.25	AF 2.0
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 0.25	AF 0.5	CF 3.5	CF 4.0	CF 3.0	CF 2.5	AF 0.0	AF 0.0	CF 2.0	CF 4.5
Tremco 830	Primer	no primer		no primer		no primer		no primer		not tested	
	Failure	AF 0.0	AF 0.0	AF 1.5	AF 2.25	AF 4.0	AF 5.5	AF 0.0	AF 0.0		
Polyurethanes:											
Tremco Vulkem 116	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 0.25	AF 0.25	AF 1.0	AF 1.0	LF 10.0	LF 9.0	AF 0.0	AF 0.0	CF 1.5	CF 1.5
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 2.5	AF 1.5	NF >11.0	NF >11	NF >11	NF >11	AF 0.0	AF 0.0	NF >11.0 LF+	LF 7.5
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	AF 0.25	AF 0.5	AF 1.0	AF 1.25	AF 4.0	AF 3.0	AF 0.0	AF 0.0	AF 1.0	AF 1.5
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer	
	Failure	LF 6.0	LF 7.5	NF >11.0	NF >11	AF/LF 10.0	LF 10.0	LF 3.0	LF 6.25	LF 2.5	LF 4.5

Color Scale:

- 0 to <3
- 3 to <6
- 6 to <9
- 9 to 11

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - Claddings, Seven to 14-Day Adhesion Test Pulls

Sealant Pull-Test Results 2013		WX		WX		WX		WX		WX		WX		WX		WX		WX		WX		WX		WX					
SEALANTS	SUBSTRATES	Date: 7/26/2013 James Hardie Hardie Plank		Date: 7/26/2013 James Hardie Hardie Panel		Date: 7/25/2013 James Hardie Hardie Trim Cedar Mill		Date: 8/13/13 Trespa Meteon		Date:8/13/13 AZEK Azek Trim		Date: 8/13/13 Boral TruExterior Trim		Date: 8/13/13 Masonry Brick		Date: 7/26/2013 Metals Metal Panel		Date: 7/25/2013 Wood Cedar, pre primed		Date: 7/31/13 Cascadia Fiberglass		Date: 7/31/13 VPI Endurance - White		Date: 8/2/13 VPI Endurance - SC			Increased Strength	No StrengthChange	Decreased Strength
	Pull Test Day:	8/2/13	8/12/13	8/2/13	8/12/13	8/2/13	8/12/13	8/21/13	8/30/13	8/21/13	8/30/13	8/21/13	8/30/13	8/21/13	8/30/13	8/2/13	8/9/13	8/2/13	8/9/13	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13				
Silicones:																													
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS		not tested		no primer		no primer		1200 OS		1200 OS		1200 OS		no primer		no primer		Dow 790			
	Failure	CF 6.0	CF 8.0	CF 8.5	NF >11 CF+	AF 4.0	AF 6.0	CF 8.0	AF 7.5			CF 10.0	CF 8.5	AF 7.0	AF 8.0 at grout CF 9.0	CF 7.0	CF 9.0 AF+	AF 3.0	AF 4.0	AF 3.5	AF 5.0	AF 4.5	AF 4.25	CF 6.25	AF 7.5		(10) Same Failure (1) Diff. Failure		
	Results	Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Different Failure				Decreased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure			8	2	1
	Primer	Primer P		Primer P		Primer P		not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		Dow 790			
	Failure	NF >11	CF 9.0	NF 11 CF +	NF >7.0	AF 2.5	AF 2.5																				(1) Same Failure (2) Diff. Failure		
	Results	Decreased Pull Different Failure		Decreased Pull Same Failure		Same Pull Same Failure																					0	1	2
Dow 791 non-porous	Primer	1200 OS		1200 OS		1200 OS		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Dow 791			
	Failure	NF >11	NF >11.0 AF+	NF >11	NF >11	CF 6.0	NF >11 CF+	NF >11.0	NF >11.0	NF >11.0	NF >11.0	NF >11.0	NF >11.0	AF/CF 11.0	AF/CF 11.0	AF >11	AF >11	NF >11	NF >11	NF >11	NF >11	NF >11	AF 5.5	NF >11	NF >11		(11) Same Failure (1) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure			1	10	1
	Primer	Primer P		Primer P		Primer P		not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		Dow 791			
	Failure	NF>11	NF >11.0	NF >11	NF >11	NF >11 CF+	AF/CF 10.0																				(3) Same Failure (0) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure																					0	2	1
Dow 795	Primer	1200 OS		1200 OS		1200 OS		no primer		no primer		not tested		Primer P		no primer		no primer		no primer		no primer		no primer		Dow 795			
	Failure	NF >11	NF >11.0	NF >11	NF >11	AF 6.0	AF /CF 9.0	NF >11.0	NF >11.0	NF >11.0	NF >11.0			NF >11.0	NF >11.0	NF >11	AF 8.75	AF/CF 8.5	NF >11 CF+	NF >11	NF > 11 CF+	NF >11 CF+	AF/CF 9.0	NF >11	NF >11		(9) Same Failure (2) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure				Same Pull Same Failure		Decreased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure			2	7	2
	Primer	Primer P		Primer P		Primer P		not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		Dow 795			
	Failure	NF >11	NF >11.0	NF 11	NF >11	AF 3.0	AF 5.0																				(3) Same Failure (0) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure																					1	2	0
Dow CWS	Primer	not tested		not tested		not tested		not tested		not tested		not tested		not tested		not tested		no primer		not tested		not tested		not tested		Dow CWS			
	Failure																	CF 9.0	NF >11								(0) Same Failure (1) Diff. Failure		
	Results																	Increased Pull Different Failure									1	0	0
Spectrem 1	Primer	Slcn Porous		Slcn Porous		Slcn Porous		no primer		not tested		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Spectrem 1			
	Failure	NF >11 CF +	NF >11 AF 6.0	NF >11	NF >11	NF >11	NF >11	NF >11.0	NF >11.0			NF >11.0	AF 8.0	NF >11.0	NF >11.0	NF >11	NF >11	AF 8.5	NF >11	CF 10.5	NF >11	AF 6.25	AF 6.5	NF >11.0	NF >11		(7) Same Failure (4) Diff. Failure		
	Results	Same Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure				Decreased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure			2	8	1
STPes:																													
Sonolastic 150 VLM	Primer	733		733		733		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Sonolastic 150			
	Failure	CF 10.5	NF >11	NF >11	NF >11	CF 10.25	AF 7.5	NF >11.0	NF >11.0	NF >11	CF 10.5	NF >11.0	CF 10.0	AF 6.5	AF 7.0	NF >11	NF >11	CF 10.75	NF >11	AF 8.5	NF >11	NF >11 CF+	NF >11 CF+	CF >11.0	NF >11		(6) Same Failure (6) Diff. Failure		
	Results	Increased Pull Different Failure		Same Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Same Pull Different Failure		Decreased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Different Failure		Increased Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure			2	8	2
	Primer	not tested		not tested		no primer		not tested		not tested		not tested		not tested		733		not tested		not tested		not tested		not tested		Sonolastic 150			
	Failure					AF 3.0	AF 3.0									NF >11	NF >11										(2) Same Failure (0) Diff. Failure		
	Results					Same Pull Same Failure										Same Pull Same Failure											0	2	0
Chem Link M1	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Chem Link M1			
	Failure	AF 3.75	AF 3.0	AF 2.25	AF 2.0	AF 0.5	AF 3.0	CF 9.0	NF >11.0	NF >11.0 CF+	NF >11.0 CF+	NF >11.0 CF+	CF/AF 9.0	NF >11.0	NF >11.0 CF+	AF 11	AF 4.5	NF >11 CF +	NF >11	CF 9.5	CF 8.5	CF 11.0	CF 10.5	CF 8.5	CF 10.75		(10) Same Failure (2) Diff. Failure		
	Results	Same Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Different Failure		Same Pull Same Failure		Decreased Pull Different Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Different Failure		Increased Pull Same Failure			3	6	3
Elastomeric Polymers:																													
Osi Quad	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Osi Quad			
	Failure	CF 3.0	CF 3.0	CF 1.0	CF 5.0	CF 2.0	CF 3.5	AF 2.5	AF 3.0	AF 1.5	AF 3.5	AF 1.5	AF 3.5	CF 2.0	AF 2.0 AF 4.0 at grout	CF 1.0	CF 2.5	CF 2.0	CF 3.0	AF/CF 3.0	AF/CF 2.5	CF 2.0	CF 2.5	CF 2.25	CF 2.5		(11) Same Failure (1) Diff. Failure		
	Results	Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Different Failure		Increased Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure			6	6	0
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer		not tested		not tested		no primer		no primer		no primer		no primer		no primer		no primer		OSI Low VOC			
	Failure	CF 5.0	CF 5.0	CF 1.25	CF 4.0	CF 2.0	CF 3.0	CF 2.0	CF 3.5					CF 2.25	CF 6.0	CF 2.0	CF 2.25	CF 1.5	CF 2.5	AF/CF 2.0	AF/CF 2.0	AF/CF 2.0	AF 2.5 CF 3.0	CF 2.75	CF 3.0		(10) Same Failure (0) Diff. Failure		
	Results	Same Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure		Increased Pull Same Failure						Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure			6	4	0
Tremco 830	Primer	no primer		no primer		no primer		not tested		not tested		not tested		not tested		no primer		no primer		not tested		not tested		no primer		Tremco 830			
	Failure	CF 8.0	AF 10.0	CF 5.5	CF 7.5	AF 0.5	AF 2.5									CF 2.0	AF 3.5 CF+	CF 3.5	CF 5.25					AF 1.75	AF 3.75		(4) Same Failure (2) Diff. Failure		
	Results	Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure										Increased Pull Different Failure		Increased Pull Same Failure						Increased Pull Same Failure			5	1	0
Polyurethanes:																													
Sonolastic TX1	Primer	733		733		733		no primer		no primer		not tested		no primer		733		no primer		no primer		no primer		no primer		Sonolastic TX1			
	Failure	NF >11	NF >11 SF+	NF >11	NF >11	AF 0.5	AF 1.0	AF 1.5	NF >11.0	AF 2.5	AF 3.0			AF 8.5	NF >11.0	NF >11	NF >11	AF 6.0	AF 9.0	NF >11.0	NF >11.0	AF 1.5	AF 2.0	NF >11	NF >11		(9) Same Failure (2) Diff. Failure		
	Results	Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Different Failure		Same Pull Same Failure				Increased Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure			3	8	
	Comments	8/12/13	8/21/13	8/12/13	8/21/13											8/9/2013	8/21/13												
OSI H2U Greenguard	Primer	not tested		not tested		not tested		not tested		not tested		not tested		no primer		no primer		no primer		no primer		no primer		no primer		OSI H2U			
	Failure													CF 10.5	NF >11.0	AF 2.0 CF+	CF 4.5	CF 5.0	CF 4.0	CF 4.0	CF 4.0	AF 7.5	AF/CF 5.5	AF 1.25	AF 0.5		(4) Same Failure (2) Diff. Failure		
	Results													Same Pull Same Failure		Increased Pull Different Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Decreased Pull Same Failure			3	2	1
Tremco Vulkem 116	Primer	not tested		not tested		not tested		not tested		not tested		not tested		no primer		not tested		not tested		not tested		not tested		not tested		Vulkem 116			
	Failure													AF 6.0	AF 7.0 NF >11.0 at grout												(1) Same Failure (0) Diff. Failure		
	Results													Increased Pull Same Failure													1	0	0
Tremco Dymonic 100	Primer	171		171		171		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Dymonic 100			
	Failure	NF >11	AF 10.5	NF >11	NF >11	NF >11	NF >11	NF >11.0	NF >11.0	AF 5.5	AF 5.5	AF 4.5	AF 6.0	AF 10.5	NF >11.0	AF >11	AF >11	AF 9.0	AF 10.5	NF >11	NF >11	AF 4.25	AF 3.0	NF >11	NF >11		(10) Same Failure (2) Diff. Failure		
	Results	Same Pull Different Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Different Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure		Increased Pull Same Failure		Same Pull Same Failure			3	9	0
Sikaflex 15 LM	Primer	429		429		429		no primer		not tested		not tested		no primer		no primer		no primer		no primer		no primer		no primer		Sikaflex 15 LM			
	Failure	AF 10.0	AF 3.0	AF 2.0	AF 2.0	NF >11	NF >11	NF >11.0	NF >11.0					NF >11.0	NF > 11.0	AF 6.0	AF 5.25	AF 3.5	AF 3.0	NF >11	NF >11	AF 2.0	AF 1.0	NF >11	NF >11		(10) Same Failure (0) Diff. Failure		
	Results	Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure						Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure			0	7	3
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		no primer		Chem-Calk			
	Failure	AF 2.0	AF 3.0	AF 3.25	AF 2.0	AF 6.0	AF 5.5	NF >11.0	NF >11.0	NF >11.0	AF 10.25	AF 8.0	AF 3.0	NF >11.0	AF 10.5 NF >11 at grout	AF 8.25	AF 9.0	NF >11	NF >11	NF >11	NF >11	NF >11.0	AF 2.5	NF >11	NF >11		(6) Same Failure (6) Diff. Failure		
	Results	Increased Pull Same Failure		Decreased Pull Same Failure		Same Pull Same Failure		Same Pull Same Failure		Decreased Pull Different Failure		Decreased Pull Same Failure		Same Pull Different Failure		Decreased Pull Same Failure		Same Pull Different Failure		Same Pull Different Failure		Decreased Pull Different Failure		Same Pull Different Failure			1	6	5
																										TOTAL	48	91	22

WCC Sealant Adhesion Study 2013

Sealants to Substrates Matrix - Claddings, Pull Strengths

Sealant Pull-Test Results 2013

SEALANTS	SUBSTRATES	WX Date: 7/26/13 James Hardie Hardie Plank		WX Date: 7/26/13 James Hardie Hardie Panel		WX Date: 7/25/13 James Hardie Hardie Trim Cedar Mill		WX Date: 8/13/13 Trespa Meteon	
	Pull Test Day:	8/2/13	8/12/13	8/2/13	8/12/13	8/2/13	8/12/13	8/21/13	8/30/13
Silicones:									
Dow 790 porous	Primer	1200 OS		1200 OS		1200 OS		1200 OS	
	Failure	CF 6.0	CF 8.0	CF 8.5	NF >11 CF+	AF 4.0	AF 6.0	CF 8.0	AF 7.5
	Primer	Primer P		Primer P		Primer P		not tested	
	Failure	NF >11	CF 9.0	NF 11 CF +	NF >7.0	AF 2.5	AF 2.5		
Dow 791	Primer	1200 OS		1200 OS		1200 OS		no primer	
	Failure	NF >11	NF >11.0 AF+	NF >11	NF >11	CF 6.0	NF >11 CF+	NF >11.0	NF >11.0
	Primer	Primer P		Primer P		Primer P		not tested	
	Failure	NF>11	NF >11.0	NF >11	NF >11	NF >11 CF+	AF/CF 10.0		
Dow 795 non-porous	Primer	1200 OS		1200 OS		1200 OS		no primer	
	Failure	NF >11	NF >11.0	NF >11	NF >11	AF 6.0	AF /CF 9.0	NF >11.0	NF >11.0
	Primer	Primer P		Primer P		Primer P		not tested	
	Failure	NF >11	NF >11.0	NF 11	NF >11	AF 3.0	AF 5.0		
Dow CWS	Primer	not tested		not tested		not tested		not tested	
	Failure								
Spectrem 1	Primer	Slcn Porous		Slcn Porous		Slcn Porous		no primer	
	Failure	NF >11 CF +	NF >11 AF 6.0	NF >11	NF >11	NF >11	NF >11	NF >11.0	NF >11.0
STPes:									
Sonolastic 150 VLM	Primer	733		733		733		no primer	
	Failure	CF 10.5	NF >11	NF >11	NF >11	CF 10.25	AF 7.5	NF >11.0	NF >11.0
	Primer	not tested		not tested		no primer		not tested	
	Failure					AF 3.0	AF 3.0		
Chem Link M1	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 3.75	AF 3.0	AF 2.25	AF 2.0	AF 0.5	AF 3.0	CF 9.0	NF >11.0
Elastomeric Polymers:									
Osi Quad	Primer	no primer		no primer		no primer		no primer	
	Failure	CF 3.0	CF 3.0	CF 1.0	CF 5.0	CF 2.0	CF 3.5	AF 2.5	AF 3.0
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer	
	Failure	CF 5.0	CF 5.0	CF 1.25	CF 4.0	CF 2.0	CF 3.0	CF 2.0	CF 3.5
Tremco 830	Primer	no primer		no primer		no primer		not tested	
	Failure	CF 8.0	AF 10.0	CF 5.5	CF 7.5	AF 0.5	AF 2.5		
Polyurethanes:									
Sonolastic TX1	Primer	733		733		733		no primer	
	Failure	NF >11	NF >11 SF+	NF >11	NF >11	AF 0.5	AF 1.0	AF 1.5	NF >11.0
OSI H2U Greenguard	Primer	not tested		not tested		not tested		not tested	
	Failure								
Tremco Vulkem 116	Primer	not tested		not tested		not tested		not tested	
	Failure								
Tremco Dymonic 100	Primer	171		171		171		no primer	
	Failure	NF >11	AF 10.5	NF >11	NF >11	NF >11	NF >11	NF >11.0	NF >11.0
Sikaflex 15 LM	Primer	429		429		429		no primer	
	Failure	AF 10.0	AF 3.0	AF 2.0	AF 2.0	NF >11	NF >11	NF >11.0	NF >11.0
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 2.0	AF 3.0	AF 3.25	AF 2.0	AF 6.0	AF 5.5	NF >11.0	NF >11.0

SEALANTS	SUBSTRATES	WX Date: 8/13/13 AZEK Azek Trim		WX Date: 8/13/13 Boral TruExterior Trim		WX Date: 8/13/13 Masonry Brick		WX Date: 7/26/2013 Metals Metal Panel	
	Pull Test Day:	8/21/13	8/30/13	8/21/13	8/30/13	8/21/13	8/30/13	8/2/13	8/9/13
Silicones:									
Dow 790 porous	Primer	not tested		no primer		no primer		1200 OS	
	Failure			CF 10.0	CF 8.5	AF 7.0	AF 8.0 at grout CF 9.0	CF 7.0	CF 9.0 AF+
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Dow 791	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11.0	NF >11.0	NF >11.0	NF >11.0	AF/CF 11.0	AF/CF 11.0	AF >11	AF >11
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Dow 795 non-porous	Primer	no primer		not tested		Primer P		no primer	
	Failure	NF >11.0	NF >11.0			NF >11.0	NF >11.0	NF >11	AF 8.75
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Dow CWS	Primer	not tested		not tested		not tested		not tested	
	Failure								
Spectrem 1	Primer	not tested		no primer		no primer		no primer	
	Failure			NF >11.0	AF 8.0	NF >11.0	NF >11.0	NF >11	NF >11
STPes:									
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11	CF 10.5	NF >11.0	CF 10.0	AF 6.5	AF 7.0	NF >11	NF >11
	Primer	not tested		not tested		not tested		733	
	Failure							NF >11	NF >11
Chem Link M1	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11.0 CF+	NF >11.0 CF+	NF >11.0 CF+	CF/AF 9.0	NF >11.0	NF >11.0 CF+	AF 11	AF 4.5
Elastomeric Polymers:									
Osi Quad	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 1.5	AF 3.5	AF 1.5	AF 3.5	CF 2.0	AF 2.0 AF 4.0 at grout	CF 1.0	CF 2.5
OSI Quad Low VOC	Primer	not tested		not tested		no primer		no primer	
	Failure					CF 2.25	CF 6.0	CF 2.0	CF 2.25
Tremco 830	Primer	not tested		not tested		not tested		no primer	
	Failure							CF 2.0	AF 3.5 CF+
Polyurethanes:									
Sonolastic TX1	Primer	no primer		not tested		no primer		733	
	Failure	AF 2.5	AF 3.0			AF 8.5	NF >11.0	NF >11	NF >11
OSI H2U Greenguard	Primer	not tested		not tested		no primer		no primer	
	Failure					CF 10.5	NF >11.0	AF 2.0 CF+	CF 4.5
Tremco Vulkem 116	Primer	not tested		not tested		no primer		not tested	
	Failure					AF 6.0	AF 7.0 NF >11.0 at grout		
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 5.5	AF 5.5	AF 4.5	AF 6.0	AF 10.5	NF >11.0	AF >11	AF >11
Sikaflex 15 LM	Primer	not tested		not tested		no primer		no primer	
	Failure					NF >11.0	NF > 11.0	AF 6.0	AF 5.25
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11.0	AF 10.25	AF 8.0	AF 3.0	NF >11.0	AF 10.5 NF >11 at grout	AF 8.25	AF 9.0

SEALANTS	SUBSTRATES	WX Date: 7/25/2013 Wood Cedar, pre primed		WX Date: 7/31/13 Cascadia Fiberglass		WX Date: 7/31/13 VPI Endurance - White		WX Date: 8/2/13 VPI Endurance - SC	
	Pull Test Day:	8/2/13	8/9/13	8/12/13	8/16/13	8/12/13	8/16/13	8/12/13	8/16/13
Silicones:									
Dow 790 porous	Primer	1200 OS		1200 OS		no primer		no primer	
	Failure	AF 3.0	AF 4.0	AF 3.5	AF 5.0	AF 4.5	AF 4.25	CF 6.25	AF 7.5
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Dow 791	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11	NF >11	NF >11	NF >11	AF 5.5	NF >11	NF >11
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Dow 795 non-porous	Primer	no primer		no primer		no primer		no primer	
	Failure	AF/CF 8.5	NF >11 CF+	NF >11	NF > 11 CF+	NF >11 CF+	AF/CF 9.0	NF >11	NF >11
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Dow CWS	Primer	no primer		not tested		not tested		not tested	
	Failure	CF 9.0	NF >11						
Spectrem 1	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 8.5	NF >11	CF 10.5	NF >11	AF 6.25	AF 6.5	NF >11.0	NF >11
STPes:									
Sonolastic 150 VLM	Primer	no primer		no primer		no primer		no primer	
	Failure	CF 10.75	NF >11	AF 8.5	NF >11	NF >11 CF+	NF >11 CF+	CF >11.0	NF >11
	Primer	not tested		not tested		not tested		not tested	
	Failure								
Chem Link M1	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11 CF +	NF >11	CF 9.5	CF 8.5	CF 11.0	CF 10.5	CF 8.5	CF 10.75
Elastomeric Polymers:									
Osi Quad	Primer	no primer		no primer		no primer		no primer	
	Failure	CF 2.0	CF 3.0	AF/CF 3.0	AF/CF 2.5	CF 2.0	CF 2.5	CF 2.25	CF 2.5
OSI Quad Low VOC	Primer	no primer		no primer		no primer		no primer	
	Failure	CF 1.5	CF 2.5	AF/CF 2.0	AF/CF 2.0	AF/CF 2.0	AF 2.5 CF 3.0	CF 2.75	CF 3.0
Tremco 830	Primer	no primer		not tested		not tested		no primer	
	Failure	CF 3.5	CF 5.25					AF 1.75	AF 3.75
Polyurethanes:									
Sonolastic TX1	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 6.0	AF 9.0	NF >11.0	NF >11.0	AF 1.5	AF 2.0	NF >11	NF >11
OSI H2U Greenguard	Primer	no primer		no primer		no primer		no primer	
	Failure	CF 5.0	CF 4.0	CF 4.0	CF 4.0	AF 7.5	AF/CF 5.5	AF 1.25	AF 0.5
Tremco Vulkem 116	Primer	not tested		not tested		not tested		not tested	
	Failure								
Tremco Dymonic 100	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 9.0	AF 10.5	NF >11	NF >11	AF 4.25	AF 3.0	NF >11	NF >11
Sikaflex 15 LM	Primer	no primer		no primer		no primer		no primer	
	Failure	AF 3.5	AF 3.0	NF >11	NF >11	AF 2.0	AF 1.0	NF >11	NF >11
Chem-Calk 2000	Primer	no primer		no primer		no primer		no primer	
	Failure	NF >11	NF >11	NF >11	NF >11	NF >11.0	AF 2.5	NF >11	NF >11

Color Scale:

- 0 to <3
- 3 to <6
- 6 to <9
- 9 to 11