Prime&Bond universal™
Universal Adhesive

Studies compilation

THE DENTAL SOLUTIONS COMPANY™

Dentsply Sirona

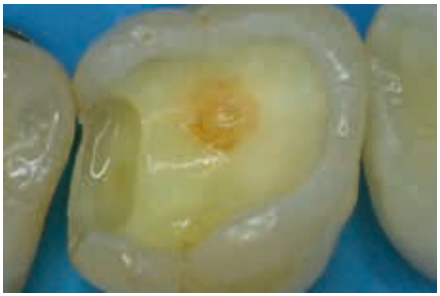
Shear Bond Strength on differently moist dentin

Most dental adhesives require an ideal amount of moisture to reach their full potential. The dentin should not be completely dry, but not wet either. However, this ideal degree of dentin moisture is not always easy to achieve. While water is still pooling in the depth of the proximal box, the larger dentin surfaces might already start getting too dry.

Most adhesives react rather sensitive to dentin that is either too wet or too dry.

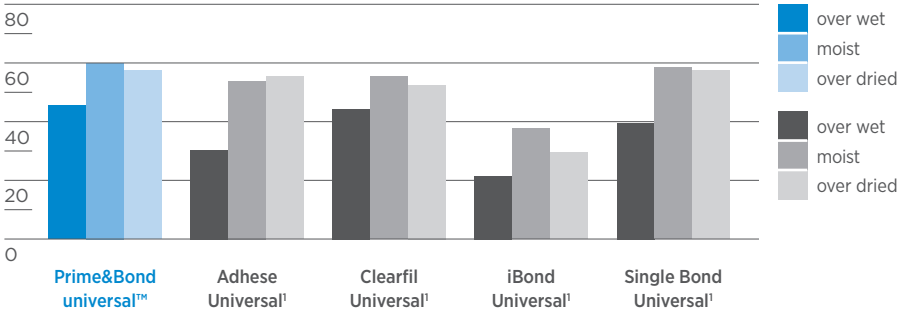
Mark Latta has simulated too wet, too dry and ideally moist dentin in his Ultradent Shear Bond Strength Test below.

Conclusion
Under ideal moisture, most tested adhesives performed equally. As soon as the conditions are not ideal, some adhesives show a significant decrease in performance.



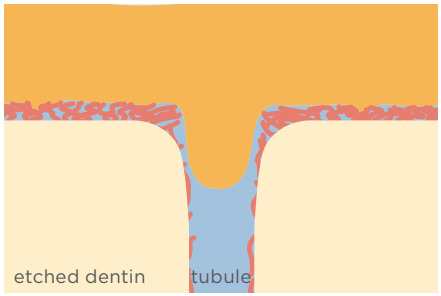
Example for different moisture levels within the same cavity: The tip of the air syringe was pointed towards the pulpal floor. The proximal box still exhibits massive water pooling. Source: Dentsply Sirona

Mean bond strength of adhesives in etch&rinse mode on differently moist dentin
Shear bond strength [MPa]



Source:
Prof. Mark Latta, Creighton University, USA.

[1] Not a registered trademark of Dentsply Sirona, Inc.



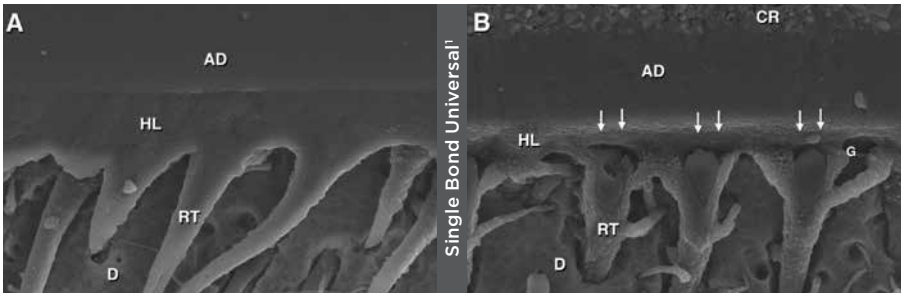
If dentin is over dried, the collagen fibers collapse and impact the adhesive bond.

Hybrid Layer of moist and over dried dentin

High bond strength does not necessarily equal tight sealing. Insufficient sealing of the dentinal structures can result in post-operative sensitivity, micro leakage and it can finally compromise the longevity of the restoration.

The following SEM* pictures show how good the adhesives could penetrate into moist and over dried dentin structures to form a distinct hybrid layer and to seal the dentinal tubules.

Conclusion
The arrows point to defects in the hybrid layer. The adhesive was not able to fully penetrate the over dried collagen network. Prime&Bond universal™ presented well-formed hybrid layers when applied to either moist or over-dried dentin and even flowed into the lateral tubules.



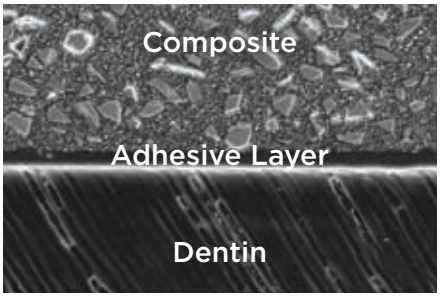
Source:
Prof. Andre Reis, Guarulhos University, Brazil.

[1] Not a registered trademark of Dentsply Sirona, Inc.
* Scanning Electron Microscope.

Film Thickness of different adhesives

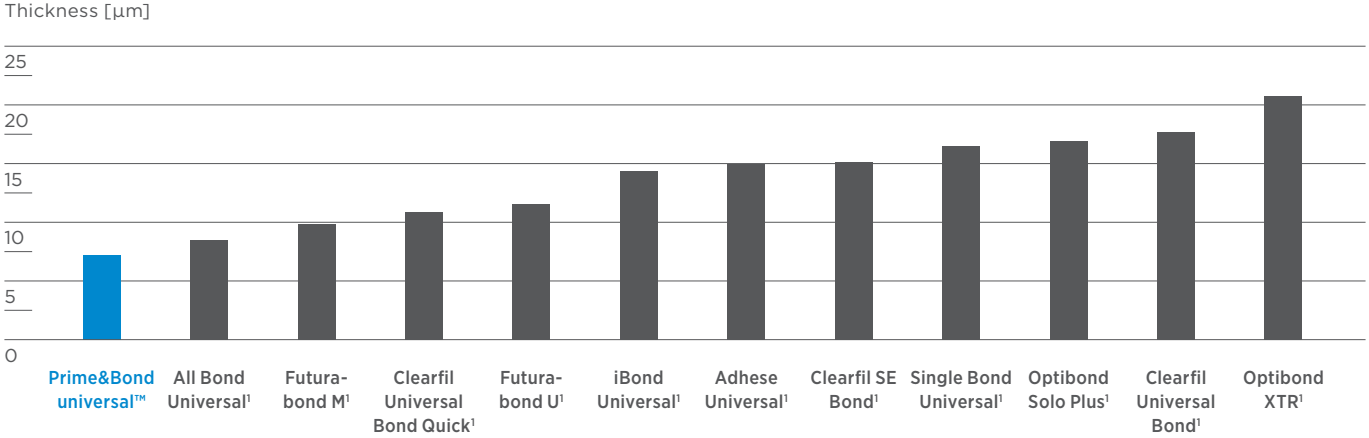
Thick adhesives can have a tendency to pool in the corners of the proximal box of a Class II restoration. These adhesive pools can show up as translucent areas on a radiograph, which can easily be misdiagnosed as a void, gap, or secondary decay, leading to unnecessary replacement. Thicker adhesives may also change crown prep geometry, impacting crown fit.

Conclusion
Prime&Bond universal™ self-levels to actively create a thin, uniform adhesive layer.



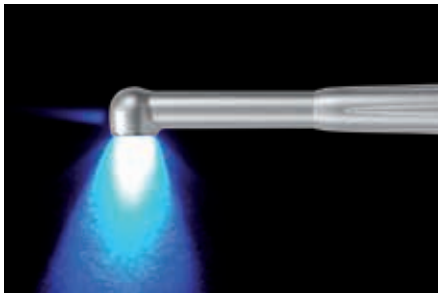
SEM picture of Prime&Bond universal™ adhesive layer in self etch mode.

Mean values of film thickness for the tested adhesives



Source:
Prof. Andre Reis, Guarulhos University, Brazil.

[1] Not a registered trademark of Dentsply Sirona, Inc.



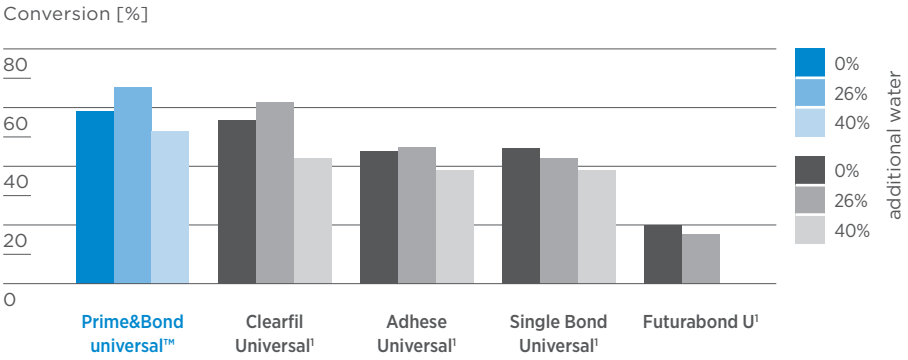
Conversion degree

When adhesives are light cured, an oxygen inhibition layer will form on the surface of the adhesive. Thus, when presenting an adhesive with a low film thickness, some people will ask if the adhesive will really cure sufficiently, or if most of the adhesive turns into the inhibition layer.

Prof. Jacques Lalevée investigated the conversion rate of different adhesives under various degrees of water contamination. The conversion rate describes the ratio of the adhesive that was properly polimerized.

Conclusion
Prime&Bond universal™ shows a high conversion rate even when the cavity is too wet.

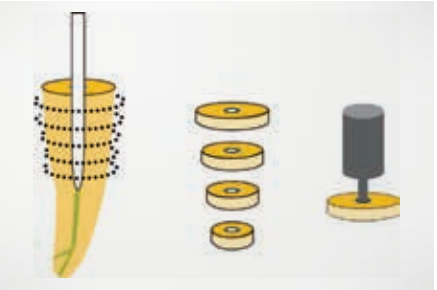
Polymerization Rate after 10 seconds of light curing



Source:
Prof. Jacques Lalevée, Mulhouse Institue, France.

[1] Not a registered trademark of Dentsply Sirona, Inc.

Post Cementation
with Self Cure Activator and core-X® flow



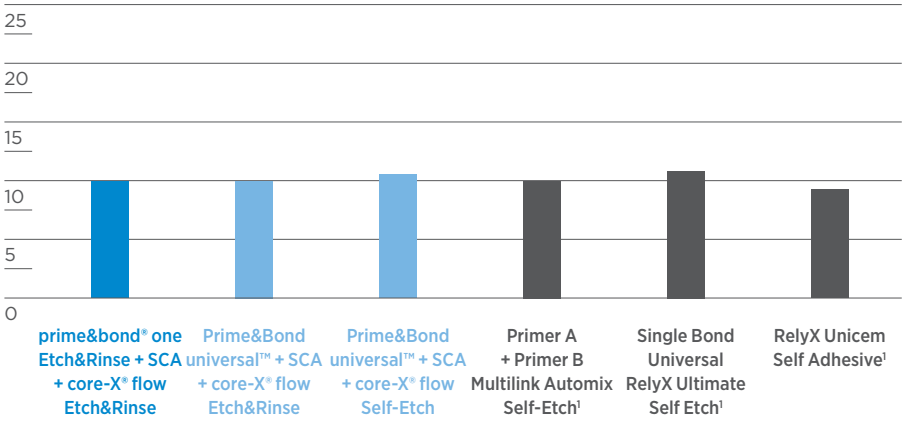
Fiber posts were cemented using different luting systems. The adhesives and luting materials were tested in the worst case scenario, that means without any light curing of either the adhesive or the cement. The teeth were then cut into slices and the push out test was performed by pushing the post out of each slice. For each group, 100 slices were tested to make sure that we get the full picture. prime&bond® one Etch&Rinse was used as reference group.

Conclusion
The results show equally high bond strength for Prime&Bond universal™ in both etching modes compared to established systems.

Technique Tip: Apply light on top of the post after seating to stabilize the post before you continue with the core build up.

Push Out Strength in total dark cure

Push Out Strength [MPa]



Source:
Prof. Simone Grandini, University of Siena, Italy.

[1] Not a registered trademark of Dentsply Sirona, Inc.

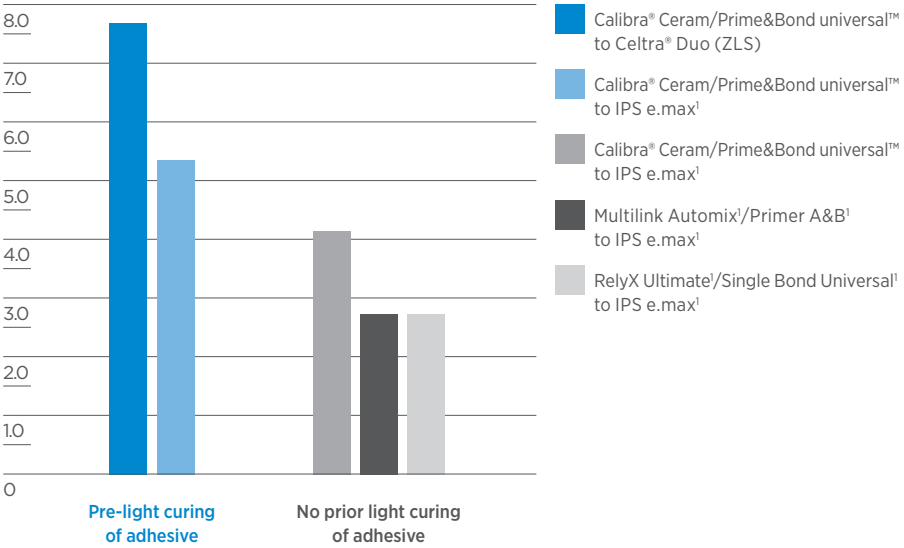
Crown Pull Test

Retention of any dental restoration to a tooth largely depends upon the taper, texture and length of the preparation and the chemical bond and strength of the cement.

This crown pull test measured the tensile bond strength of different CAD/CAM crowns. Ceramics were treated with 5% HF and silanated. All adhesives were used in self-etch mode. Artificial aging was simulated by thermocycling (10.000 cycles, 5-55 °C).

Crown Retention after 10,000 TC

[MPa]



Source:
Prof. John Burgess, University of Alabama, USA.

[1] Not a registered trademark of Dentsply Sirona, Inc.

Tensile bond strength of different Universal Adhesive Systems to lithium disilicate ceramics

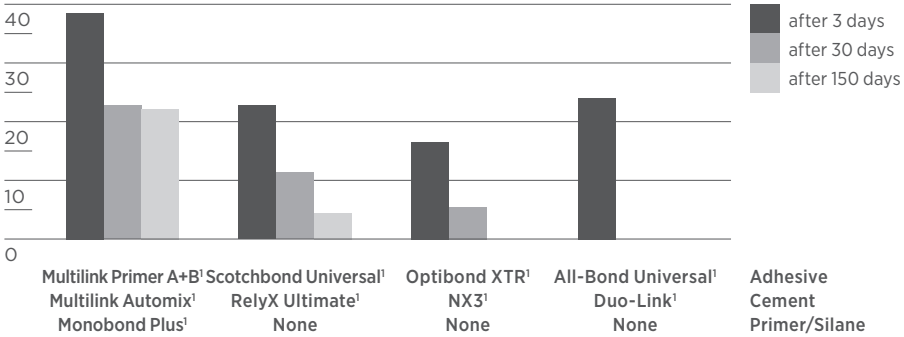
To investigate whether a universal adhesive can replace the use of a dedicated silane primer for glass ceramic restorations, the following study was conducted.

IPS e.max CAD[1] disk-like specimens were etched and bonded to a resin cement. To mimic different ageing steps, the specimens were stored:
- at 37 °C for 3 days without thermal cycling (i.e. no ageing)
- for 30 days with 7,500 thermal cycles
- for 150 days 37,500 thermal cycles

After the artificial ageing was completed, tensile bond strength was tested for all specimens.

Results
Initially, all adhesive systems exhibited considerable tensile bond strength, but some showed a significant reduction after 30 days of storage.

Tensile Bond Strength after thermal cycling
[MPa]



The study above proves that Universal Adhesives Systems cannot substitute a primer for glass ceramic or silane. The Multilink Automix system[1] was used in combination with the glass ceramic primer Monobond Plus[1] (Ivoclar Vivadent), resulting in significantly higher long term bond strength.

Source:
Nicole Passia, DrMedDent; Frank Lehmann, Dipl-Ing; Sandra Freitag-Wolf, DrRerNat; Matthias Kern, DrMedDentHabil.
JADA 146(10); page 729-734; October 2015; http://jada.ada.org

[1] Not a registered trademark of Dentsply Sirona, Inc.

Effectiveness and stability of silane coupling agent incorporated in ‘universal’ adhesives

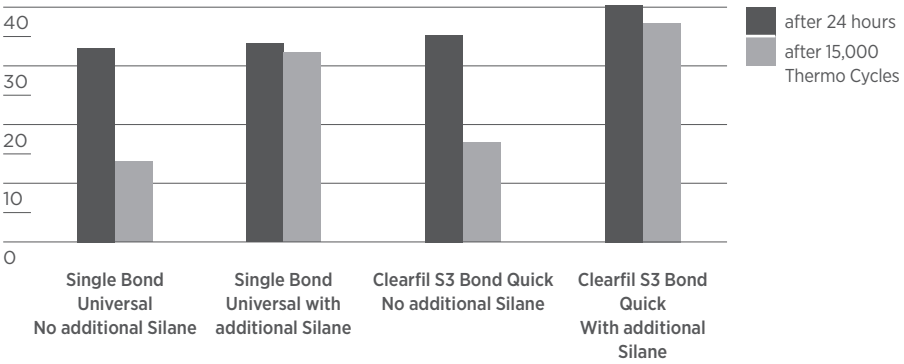
For bonding indirect restorations, some universal adhesives incorporate a silane coupling agent to chemically bond to glass ceramics so that a separate ceramic primer is claimed to be no longer needed.

It is generally well known that water-containing and acidic single-bottle, pre-hydrolyzed silane coupling agents have a relatively short shelf life[1]. In light of this knowledge and because independent research data are insufficiently available, the study investigated the silanization potential of a universal adhesive incorporating a silane coupling agent by measuring bond strength to glass plates and CAD-CAM composite blocks.

Conclusion
The silane-coupling effect in the tested silane-containing universal adhesive did not appear very effective and stable.

Bond Strength

Shear Bond Strength [MPa]



Source:
Yoshihara K, Van Meerbeek B, et al. Dent Materials, October 2016, Volume 32, Issue 10, Pages 1218–1225.

[1] Lung CY, Matinlinna JP. Aspects of silane coupling agentsand surface conditioning in dentistry: an overview. DentMater 2012;28(5):467–77.

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