INTRODUCTION

360° Product testing has been retained to confirm performance-testing of Brand. Brand is a liquid plastic cured by the use of an UV LED for at least 4 seconds, which cures the liquid to a solid. The client provided several instructional videos and materials to demonstrate how the product can be used for repairs or general use in several scenarios, such as bonding to glass, metal, plastic, and wood. Each bonding test outcome was checked by supplied videos and/or materials to determine whether Brand worked as claimed or shown.

Temperature Test

Ten cured drops on the exterior of a metal box were supplied by the client. Two of the drops were observed to be poorly attached to the metal box, but both poorly attached drops were firmly cured. Ten more drops were created by 360° near the existing drops and labeled.

A YTH-225-70-1P programmable environmental chamber (shown to the right) was employed to test the temperature stability of the cured liquid drops. The thermal chamber was lowered from ambient temperature to -40°C, stabilized there for about an hour, then raised to +150°C and allowed to stabilize for about an hour. All of the tested drops were visually inspected after experiencing the thermal extremes.

Ten cured liquid drops (outlined below in Fig. 3 in **green**) were found to be solidly attached to the metal box after the temperature-extremes test.

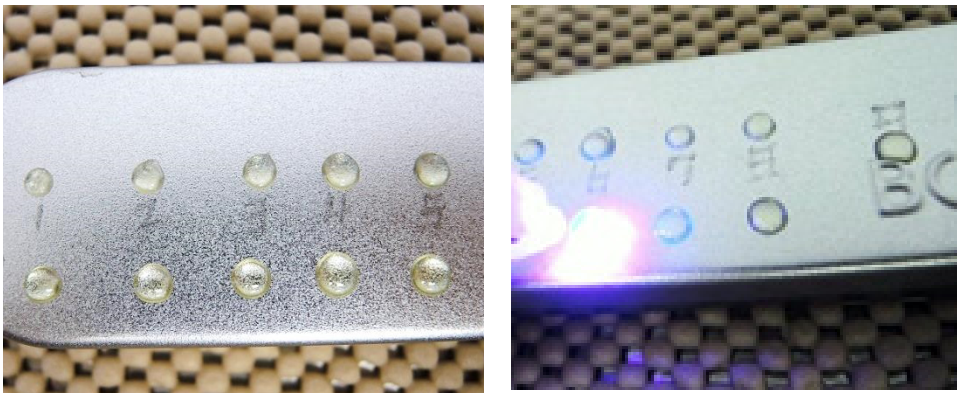


Figure 1: Ten cured liquid drops were prepared and labeled before temperature test.

Figure 2: Ten cured liquid drops were subjected to -40°C (left) and +150°C (right).

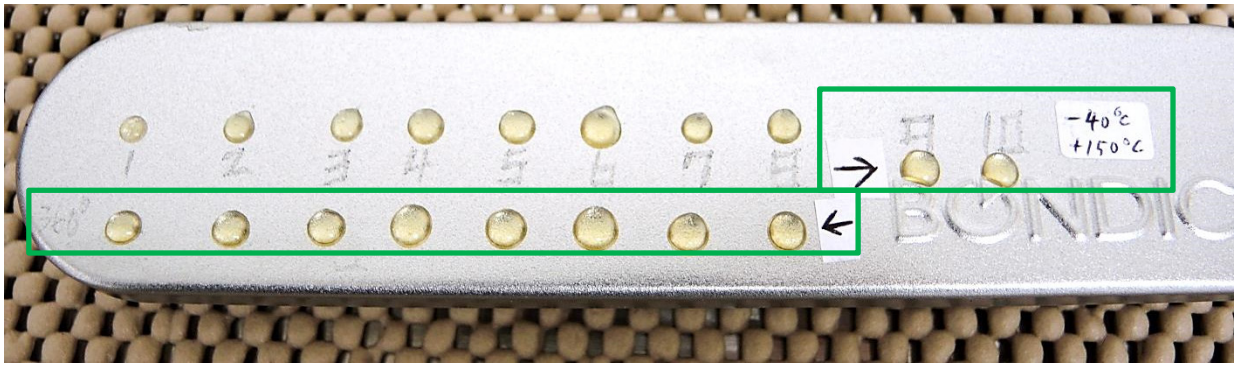


Figure 3: Ten cured liquid drops were visually inspected after the -40°C to +150°C temperatures.

Strength Test (≤ 200 lbs. **)**

360° Product Testing first confirmed the Client-provided eyebolts (each weighing 153 grams), coupled with the cured material, were capable of supporting 200 pounds, by subjecting the provided eyebolts and coupling to a 200+ pound load-pull test. A custom test jig to provide a 200+ pound load was made with several nylon lifting straps around a 55 gallon water barrel. A Torrey CRS-HD 500kg/1000 pound - rated hanging crane scale was used to weigh the load. Sufficient water was poured into the barrel that the entire hanging load on the eyebolts and coupling were a minimum of 200 pounds. A steel wire safety cable was threaded through the bottom eyebolt to limit flying debris in the event the coupling broke.

The Client-provided original coupling and eyebolts did support at least 200 pounds for at least 15 minutes.

Next, 360° created a similar coupling of cured material by following the provided instructional video. The original coupling was unscrewed from the two eyebolts, measured, and found to weigh 7.3 grams, an average of about 0.082”-thick, and about 1.4 inches long. To duplicate the coupling, each eyebolt was then bonded together again. It was found that more than two of the uncured liquid tubes (each 4 ml) were required to duplicate the original coupling. Notably, no particular amount of Brand had been specified in order to achieve a 200 lb. load capacity; thus, 360° essentially duplicated the provided sample coupling for the two eyebolts.

The 360° Product Testing produced coupling over the ends of the eyebolts did support a load weighing over 200 pounds for at least 15 minutes.

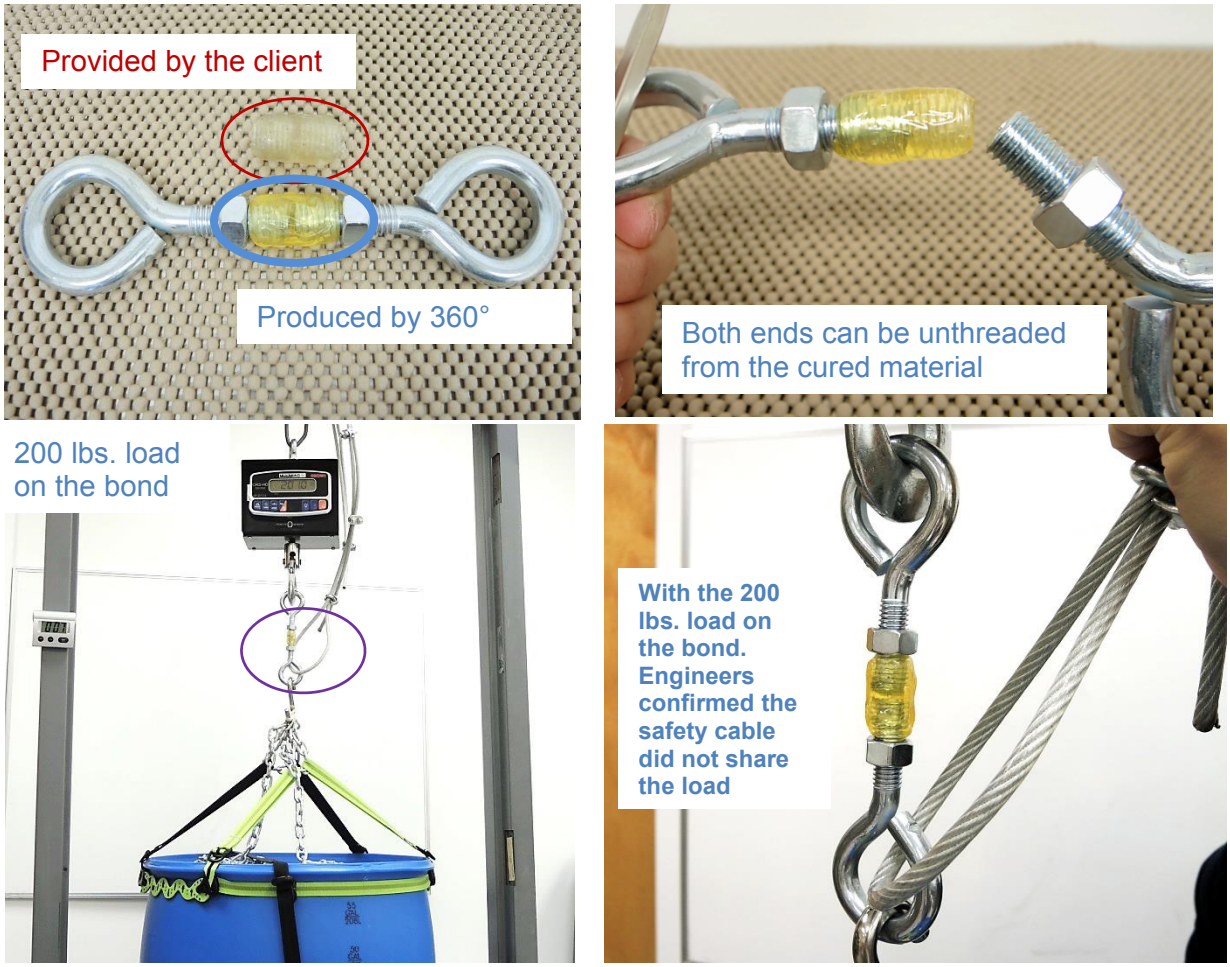


Figure 4: 200 lbs. load on coupling bond between two eyebolts.

Confirm you can thread it

Two machine screws were provided by the client. 360° engineers followed the instructional video by curing the liquid onto the end of one screw, and then bonding to the end of the other screw. After confirming that a cured liquid bond was made between two screws, it was then confirmed that both screws could be unthreaded from the cured liquid.

Figure 5: Confirming two screws can be unthreaded from the cured liquid.

Confirmation of Metal "Bond"

After conducting the two tests above (i.e., "Strength Test" and "Confirm you can thread it"), Brand appears to provide a "bond" between two tested metal objects (i.e., eyebolts and screws) without changing the metal object physically or chemically.

Underwater Test

A glass container and several provided plastic pellets were used for the underwater bond test. 360° tested several plastic pellets first by attaching them to the side of the container (approximately 1/16" thickness). Then a plastic plant was attached to the bottom (as shown in the red circle at right) of the container (approximately 1/5" thickness). Both objects were successfully attached to the glass underwater by using Brand cured with the UV LED outside of the container.

Figure 6: Bottom view of the glass container after test

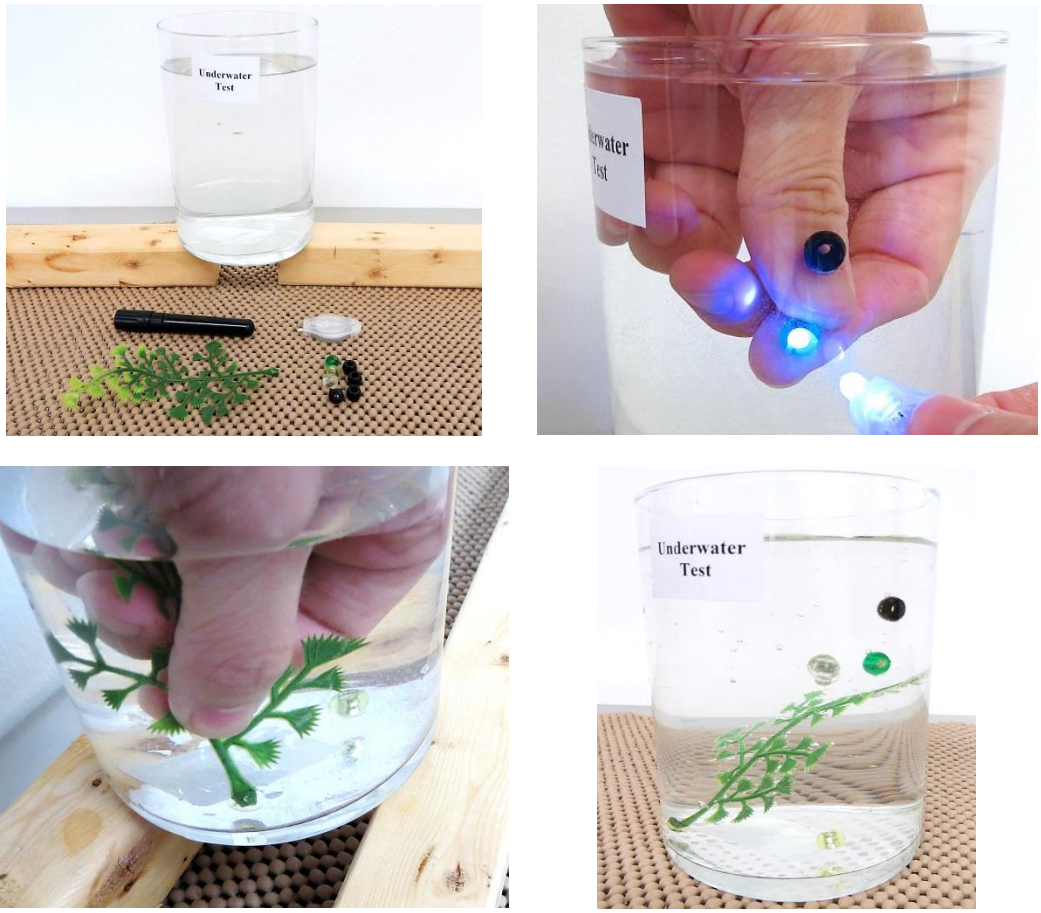


Figure 7: Bond Objects Underwater Test, curing Brand through the glass.

Bond - to - Glass Test

A provided 6” x 6” square glass mirror and a plastic swimming goggle eyepiece were mounted vertically, and the product was used as instructed in the video. A provided hanging ornament (weight: 23.3 g) was hung from the “hook”. A key-chain (weight: 26.4 g) was also tested during the hanging test.

Figure 8: Bond-to-Glass Test – Mirror.

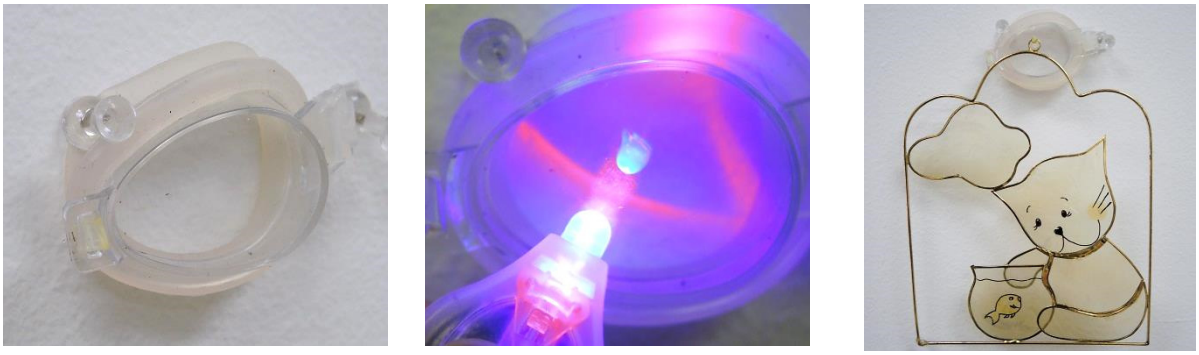


Figure 9: Bond-to-Glass Test – Goggles eyepiece.

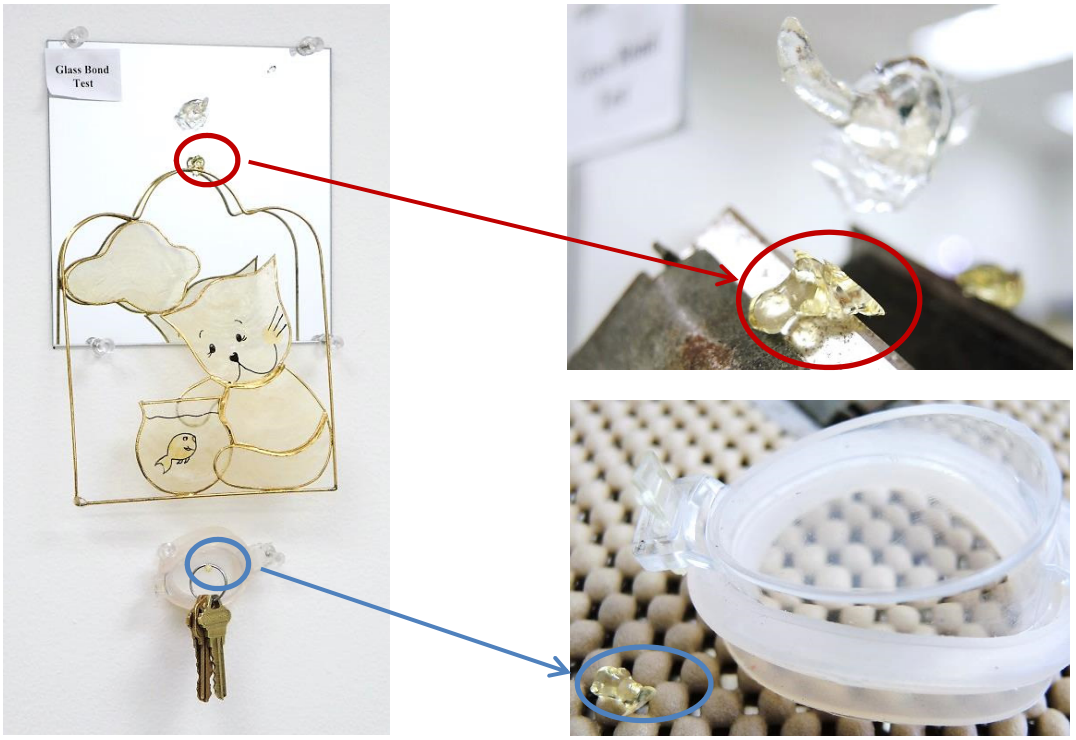


Figure 10: Bond-to-glass and plastic for hanging objects. The photos to the right show how the product could be scraped off the mirror using a razor blade.

After curing the “hook” and hanging items for an hour, both “hooks” were deemed to have passed the glass bond test. A razor blade was then used to remove both bonded “hooks” from the glass and plastic surfaces, during which both “hooks” were noted to be fairly easy to remove by a regular razor blade.

Pressure Test on Copper Pipe

As directed, 360° drilled a 1/8" hole in a copper pipe. After sanding the surrounding area on the copper pipe, 2-3 drops of Brand were used to seal the hole and create a bead about ¼" round. A ¼"-wide ring was also made around the pipe and cured. A Campbell Hausfeld FO204800 air compressor was used to pressurize the copper pipe. The below pictured air compressor was rated for 100 psi but could only produce 80 - 90 psi in the copper pipe. Thus, a bicycle pump, BELL Air Attack 500, rated for 120 psi, was then used to achieve approximately 120 psi in the sealed copper pipe. Notably, the sanded surface provided necessary roughness for bonding of the cured liquid, and the wide ring around the pipe provided better retention of the seal.

Figure 11: Pressure Test on Copper Pipe.

Repair Glasses Stem

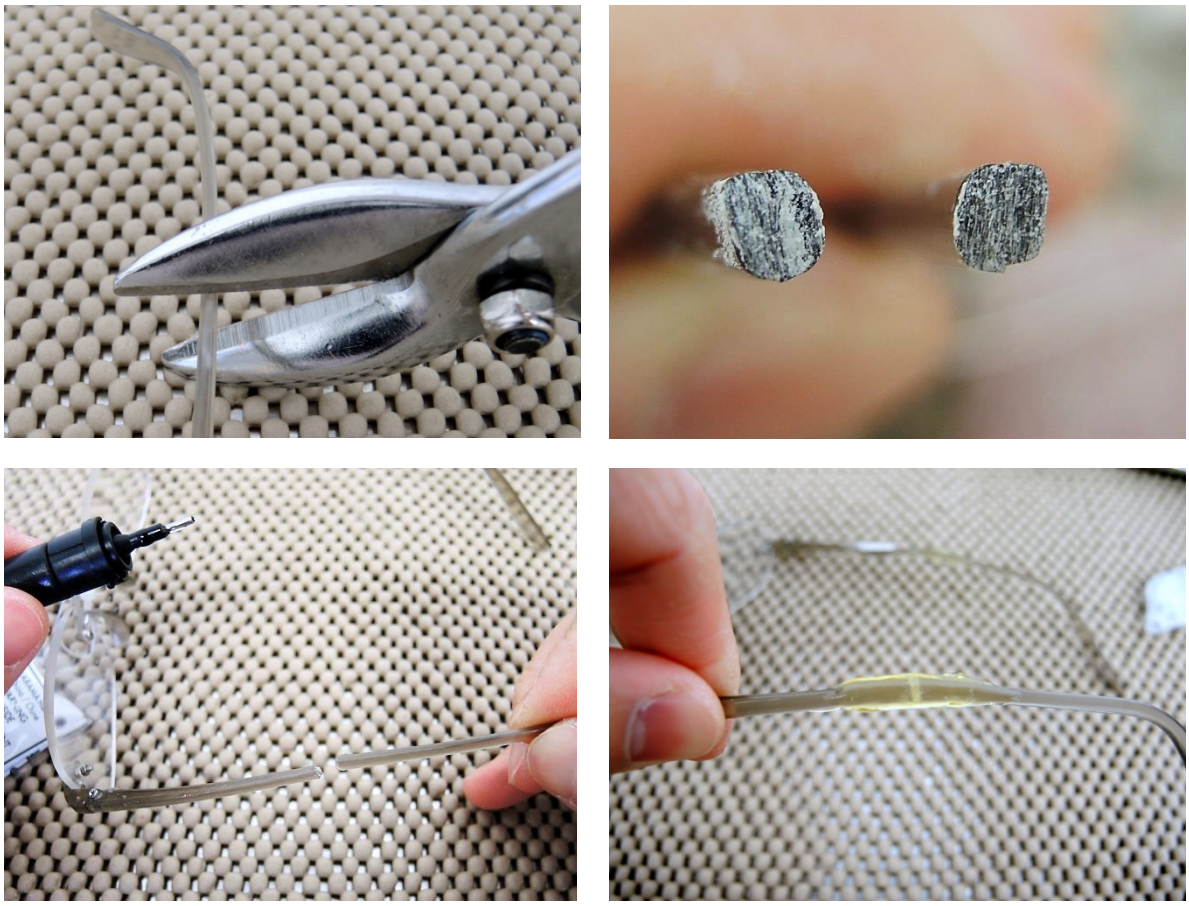


Figure 12: Bond to Plastic (repair the provided plastic glasses); Sequence of test photos. Cut, roughly sand both ends, and make a thin sleeve of the product on the ends.

The plastic stem of a pair of eye glasses was bent before cutting, and the plastic stem was noted to be flexible (in comparison to the wooden sticks used later in this test report). After cutting, sanding, and bonding with the cured liquid, 360° observed that the broken glasses stem could be reconnected by using a sufficient amount of Brand. It appeared that the broken cut requires approximately an inch long thin sleeve of Brand across both ends for bonding. Notably, 360° engineers compared sanded and un-sanded broken edges before bonding; sanded broken edges were easier to be reconnected than edges which were un-sanded.

Bond to wood

Four wooden sticks and two pre-bonded samples were provided for testing. The Client-provided cured liquid sample bonds measured about one inch in length, or about a half inch on each half of the repaired wooden stick. 360° bonded two wooden sticks with Brand and used the cured liquid in a similar amount to the provided test samplest. Note that one of the provided wooden sticks was bent by hand, and confirmed to break easily.

Figure 13: Bond to wooden sticks test.

After successfully bonding the sticks (as shown above), the first bond-to-wood test was then performed by bending of the bonding as the center point from the far ends. Since the first attempt was bent from two far ends of the wooden stickers, 360° then decided to bend from a shorter distance, closer to the center. The second bending test resulted in a smaller arc radius, but Brand bond still appeared stronger and more flexible than the break-point.

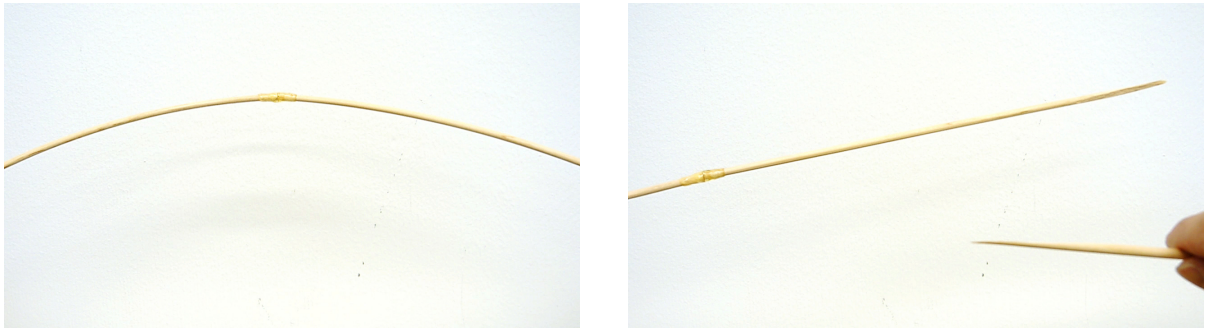


Figure 14: First bond to wood test (bent from far ends).

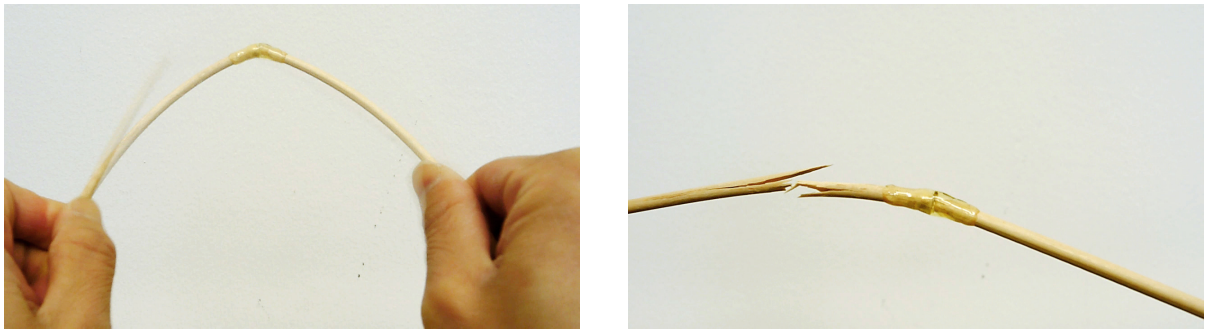


Figure 15: Second bond to wood test (bent from close edges).

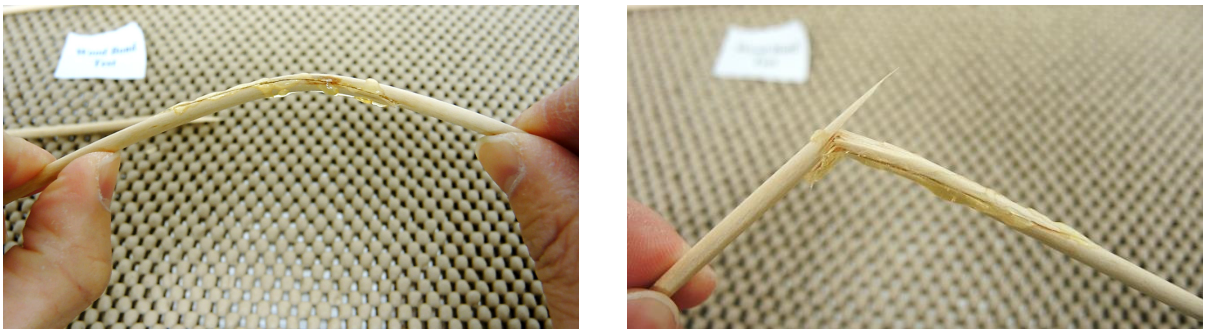
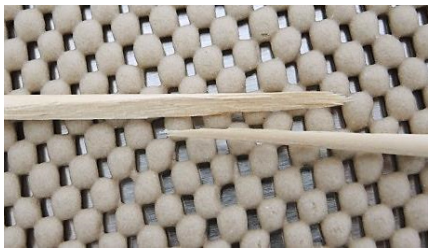


Figure 16: Third bond to wood test (a fixed wooden stick, bent from close edge).



The third bond to wood test was based on a broken section from the first test (as shown on the left). Two broken sections were bonded with Brand. The cured liquid was sandwiched in the cut and spiraled around the broken stick. The repaired wooden stick was then bent again, and was observed to bend flexibly. Notably, a new break point was created when it bent; however, Brand bond appeared less vulnerable after the repair.

Bond to ceramic

A ceramic bowl with two chips in the top rim (as shown below) was provided. Also provided was a sanded, cured-liquid filler “chip” for one of the chips for demonstration. 360° filled the other chip with Brand in several layers. The UV LED was used as directed to cure each layer. The cured liquid was capable of bonding to, and filling the chip, in the tested ceramic bowl, and also could be sanded for shaping purposes. After sanding, the cured Brand was then painted with white nail polish.

Figure 17: Bond to ceramic test. Brand was observed to be easy to use to fill-in the missing chip, and was then sanded for finishing, and painted with white nail polish.

CONCLUSION

- Brand proved able to be cured into a robust solid by using the companion UV LED light for more than 4 seconds.

- In some applications, sanding or making a surrounding ring is required before applying the liquid Brand. Such preparation allows bonding of materials (e.g., eyebolts, plastic glasses stems) without changing the basic nature of the bonded objects.

- The tested Brand's performance was observed to be consistent with marketed demonstrations.