Heat Damage And Stationary Glass

Figure 1 - Fire damage to this vehicle was caused by faulty wiring in the dash panel.

Stationary glass, especially the windshield, is part of the vehicle structure. It contributes to the strength of the roof and pillars, and helps keep occupants from exiting the vehicle during a collision.

COMPLETELY shattered glass or cracks where the glass was struck are examples of easily identifiable glass damage. However, the overall structural integrity of a stationary glass assembly may be adversely affected when exposed to excessive heat from a vehicle fire. This type of damage may not be recognized as easily.

Although some vehicle fires are caused by collisions, many are not. Other causes for vehicle fires include faulty wiring (see Figure 1), fluid leaks, the exhaust system, smoking, and vandalism. A vehicle may also be exposed to excessive heat or fire if it is parked near a burning building or another vehicle. A vehicle that has been damaged by fire requires a close inspection of stationary glass, even if there are no obvious signs of damage. Heat-damaged parts, adjacent to stationary glass, may indicate that the glass should be inspected further (see Figure 2).

Glass Inspection

Inspecting stationary glass on a fire-damaged vehicle may include checking for a smoky haze or stain that cannot be removed using conventional glass cleaners and techniques. Permanently stained glass should be replaced because the reduced visibility is a safety hazard. Also look for signs of delamination on laminated glass. Delamination is when one or both layers of glass begin to separate from the inner polymer layer. This may appear as a bubbling near the edge of the glass. Glass that appears to be delaminating should be replaced because the structural integrity of the glass is likely to have been compromised.

Adhesive Concern

The integrity of the adhesive that bonds the glass to the vehicle is just as important as the glass itself. It is a reasonable concern that the structural integrity of the urethane adhesive may also be adversely affected when exposed to excessive heat, and result in a much weaker bond.

To confirm this, I-CAR conducted some basic tests to see how heat may affect glass urethane adhesive. The materials we used for the test included 63 mm (2 1/2") long coupons cut from an OEM painted panel, glass urethane, and square-shaped steel tubing. Steel tubing was initially chosen because we intended to use tensile-testing equipment to determine the extent the adhesive was weakened. However, we

Figure 2 - The plastic trim panel at the bottom of the windshield started to warp from excessive heat, caused by a vehicle fire.

Figure 3 - The sample shows substantial degradation of the urethane adhesive.

realized that this would not be necessary after some preliminary experiments.

We applied the recommended pinchweld primer to both the painted coupons and the steel tubing, and bonded them together with the glass urethane. The samples were allowed to fully cure before heating them in a small convection oven. The samples were heated to 121°C (250°F), 149°C (300°F), and 177°C (350°F). Each sample was left in the oven for ten minutes once the specified temperature was reached. The samples were then removed from the oven and allowed to cool to room temperature. The urethane on the samples that reached 149°C (300°F) and 177°C (350°F) expanded and the adhesion to the pinchweld primer failed (see Figure 3). The samples were able to be pulled apart by hand relatively easily. The urethane on the 121°C (250°F) sample did not show any obvious signs of degradation, however the temperatures of the samples were monitored using a non-contact thermometer and should not be considered exact.

The basic intention was to determine if excessive heat has the potential to adversely affect the urethane adhesive that bonds the glass to the vehicle. In the test we conducted, we found that it does. Knowing this, industry professionals may want to consider complete replacement of the urethane adhesive when replacing heat-damaged stationary glass. This would require completely removing any remaining adhesive after the glass has been removed, without leaving an existing 1 or 2 mm adhesive bed as would be done when normally removing and reinstalling the glass. Refer to vehicle-specific service information or the adhesive manufacturer's procedures to determine how the vehicle flange and glass should be prepared for re-bonding.

Although not related to the subject of this article, another interesting fact we discovered while conducting this test was that the urethane took an extended amount of time to fully cure in the relatively dry, cool atmosphere of our repair facility. This condition is not uncommon during the winter months. Exposure to humidity was the key to initiating a full cure of the urethane adhesive.

Conclusion

Stationary glass is an important part of the vehicle structure. A vehicle fire may cause damage to the glass that is not easily seen. A smoky haze on the glass or adjacent heat-damaged parts are indications that the glass should be inspected further. Replace the glass if there are any signs of the glass delaminating. If there are any indications or concerns that the structural integrity of the urethane adhesive has been compromised, complete removal of the urethane should be considered.

This article first appeared in the I-CAR Advantage Online, which is published and distributed free of charge. I-CAR, the Inter-Industry Conference on Auto Collision Repair, is a not-for-profit international training organization that researches and develops quality technical education programs related to automotive repair. To learn more about I-CAR, and to subscribe to the free publication, visit www.i-car.co.nz, then click on 'Links', then 'I-CAR Advantage Online'.

For information on I-CAR training courses conducted throughout New Zealand, contact I-CAR NEW ZEALAND Phone 07 - 847 0218