ASA/NAPDRT Aluminum Study

Final Report

June 1, 2016

Automotive Service Association®
Driving Your Success!
8209 Mid Cities Blvd. • North Richland Hills, Texas 76182-4712
(817) 514-2900 • Fax (817) 581-3572 • www.ASAshop.org • www.TakingTheHill.com • www.AutoInc.org

ASA/NAPDRT Aluminum Study

Final Report • June 1, 2016

Overview

The National Alliance of Paintless Dent Repair Technicians (NAPDRT) approached the Automotive Service Association (ASA) in December of 2015 with a request for any information ASA had on the difference between steel and aluminum panels pursuant to Paintless Dent Repair (PDR). The NAPDRT reported that some of its members were encountering apparent confusion among collision damage estimators as to the differences in the PDR process when repairing steel vs. aluminum panels and were seeking available independent studies to confirm the field experience reported by its members on the differences in the repair process, specifically when dealing with aluminum. Since no such data existed in the ASA Resource Center records, a study was initiated as a cooperative effort between NAPDRT and ASA to document the PDR repair process when dealing with aluminum panels.

Research Parameters

The study was conducted under controlled conditions at a training center. Examples of both steel and aluminum hoods were subjected to simulated hail damage using a force gauge to create consistent damage at various pressures, and then the force necessary to remove the damage was measured and compared. The study was limited to PDR as applied to this simulated hail damage and does not represent a general assessment of aluminum repair or PDR processes beyond vertical impact damage. Forces applied were measured and recorded as data points and compiled in the included spreadsheet for comparison.

Participants in the study included representatives from ASA and the NAPDRT. (Left to right) Scott Benavidez, AAM, Tommy Clayton, Paul Kordon and Chris Dillard.

NOTE: This study was a sampling of randomly selected hoods and is not meant to be projectable across all makes and models; rather, it is a representative sampling snapshot that may indicate more in-depth studies are necessary to develop a more comprehensive database from which to draw general conclusions.

Location
Audi Training Center
21660 Red Rum Drive
Ashburn, VA 20147

Wednesday, January 6, 2016

Attendees and Affiliations
Leonard Cicchiello – NAPDRT
Chris Dillard – NAPDRT
Tommy Clayton – NAPDRT
Scott Benavidez – ASA Collision Division Director and collision shop owner
Jason Bartanen – I-CAR
Gerry Poirier – Farmers Insurance
Russell Thrall – CollisionWeek
Paul Kordon – Dentmasters
Tony Molla – ASA
Shawn Hart, Warren Barbee, Mark Allen – Audi

Force gauge used in aluminum repair study.

Study Methodology
Samples of steel and aluminum hoods from both import and domestic vehicle models were acquired for the study. Working under controlled conditions at an OEM training center, both types of hoods were set up on horizontal fixtures simulating the typical attitude of the panels in service. Using a force gauge, pressure was applied to indent the panels at various levels of force to simulate hail damage, creating uniform damage areas that were measured and recorded. PDR methods were then applied, and the resulting force and

process necessary to remove the dents were also measured and recorded. The results were compiled in an Excel spreadsheet for analysis.

Precision depth gauge used to measure damage.

It was noted in a briefing prior to the actual work that many factors can affect the process necessary to reverse hail damage on aluminum panels due to the wide range of aluminum types used by the various manufacturers and the differences in thickness of the aluminum used in production.

Study Results

Where available, the metal thickness on both types of panels was added to the spreadsheet.

The average damage depth at 45 pounds pressure on the aluminum hoods was .0033 inches.
The average damage depth at 45 pounds pressure on the steel hoods was .0083 inches.

The average damage depth at 75 pounds pressure on the aluminum hoods was .010 inches.
The average damage depth at 75 pounds on the steel hoods was .017 inches.

In applying PDR repair procedures, the NAPDRT technicians in the study estimated that it took between 70 percent to 150 percent more pressure to repair the damage in aluminum vs. steel hoods. The wide range of the estimate reflects the difference in extent of damage, along with the inability to know precisely what type of aluminum is used by the OEM. Practical experience also shows that steel is easier to push than aluminum using PDR. Just as aluminum is more resistant to damage, the metal is more difficult to move using PDR techniques and has different "memory" characteristics.

Warren Barbee, VW collision trainer, explains the differences between the different grades of aluminum to study participants.

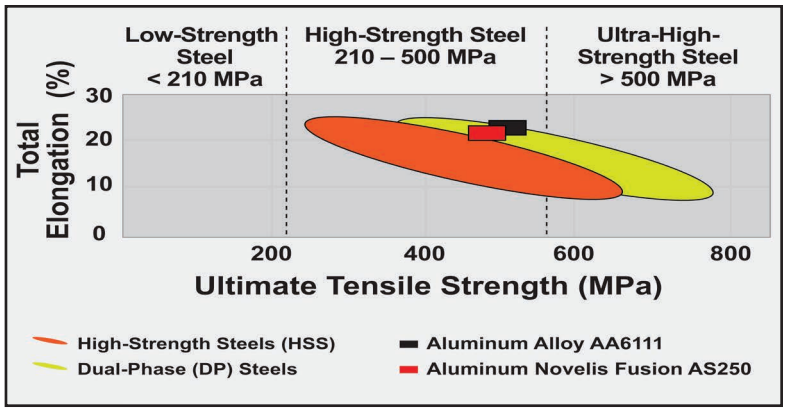
Vehicle Hood (Type)	Peak Pressure to Dent in Pounds	Dent Depth in Inches	Push Pressure for PDR to Repair (lbs)	Metal Thickness
2008 Volvo (AL)	45	0.003		
	70	0.01		
Nissan Altima (AL)	73	0.01	63.49	
	75	0.011		
	46	0.004		
2009 Mustang (AL)	46	0.002	65.92	0.9mm
	76	0.009		
2012 Buick (AL)	46	0.003		0.9mm
	73	0.009		
2013 Nissan Sentra (AL)	45	0.002		
	73	0.01		
2014 Ford Fusion (AL)	46	0.012		0.9mm
	73	0.025		
2010 Honda hood (ST)	47	0.007	63.63	
	72	0.016	72	
2008 Toyota Corolla (AM/ST)	45	0.012	45.19	0.7mm
	73	0.025		
2011 KIA Soul (ST)	48	0.011		0.65mm
	75	0.02		
2005 Honda Accord (ST)	46	0.004 (W)		0.7mm
	45.5	.008 (N)		
	73	.011 (N)		
2008 Toyota Corolla (AM/ST)	46	.008 (W)		1.9mm
	74.5	.017 (W)		
2015 Toyota Camry (ST)	45.7	0.008		0.75mm
	72.6	0.015	69.98	

Related Comments

Doug Richman of Kaiser Aluminum cautioned that not all of the aluminums used by different automakers are the same, and they will act differently during repairs. "The bad news is there's no way folks in your business can tell which version of aluminum they're looking at," he said. "There are no visual distinguishing characteristics you can [use to] determine what the alloy is and what the temper is. But the variations will have a different impact in how you approach the repair. The solution is: We all need to be sure we're paying attention to the OEM guidelines for the repair of a specific model. They know for each part what the alloy is, what the temper is and how it needs to be handled." He said most of the aluminums being used are a "T4" temper, which is lower-strength and thus can be formed into complex shapes in the manufacturing process. But some manufacturers, primarily European automakers of higher-end vehicles, then put vehicles through an age (or bake) cycle that raises the aluminum to a "T6" temper is at least 50 percent stronger than "T4." This allows them to maximize weight reductions by using even thinner grades of aluminum than, say, that used on the F-150, while still being strong and damage resistant. Heat from welding can significantly reduce the tensile strength of aluminum, which is why some automakers require the use of specific welders and why OEM procedures often call for using backing plate when joining to restore the full strength of that area of the vehicle.

A variety of aluminum and steel hoods were used from both import and domestic manufacturers.

Conclusion



The initial results and observation during the testing phase confirmed the assumption that it is more difficult to use PDR techniques to reverse hail damage on aluminum panels vs. steel. It's not simply a matter of applying more force to remove the damage, since the differences between the two metals and the various grades of aluminum used by vehicle manufacturers also require an adjustment in the process and methods used to achieve acceptable results.

As stated, this has been a snapshot, and a more comprehensive study is recommended to expand and reconfirm the results from this exercise to develop recommendations of a broader scope.

"This aluminum vs. steel study shows, under controlled conditions, that multiple different types of aluminum have a higher tensile strength than any of the steels we tested," said Len Cicchiello. "The range of that strength varies and so will the amount of force needed to move the metal back to its original condition. This study shows, numerically, what we as Paintless Dent Repair Technicians have been saying all along. It is much harder to fix aluminum panels."

This white paper was produced by the Automotive Service Association Collision Division with the cooperation of the National Alliance of Paintless Dent Repair Technicians (NAPDRT). Special thanks to Volkswagen (VW) and Audi Training Center in Ashburn, Va.

If you enjoyed this white paper, check out the Tools and Resources *section of the ASA website at www.ASAshop.org. While you're there, you can also read the latest issue of the Collision Division newsletter under the* News and Press *section.*

Automotive Service Association®
Driving Your Success!
8209 Mid Cities Blvd. • North Richland Hills, Texas 76182-4712
(817) 514-2900 • Fax (817) 581-3572 • www.ASAshop.org • www.TakingTheHill.com • www.AutoInc.org