NEW WHEEL STANDARDS

National Highway Traffic Safety Administration (NHTSA) safety standards that reference wheels (rims):

- FMVSS No. 110 (tire selection/rims for passenger cars weighing less than 10,000 pounds)
- FMVSS No. 120 (tire selection/rims for vehicles weighing more than 10,000 pounds)

- The rules are focused on making sure the vehicle has the proper size tire/wheel combination. They do not establish performance requirements
FMVSS are regulations issued by NHTSA that set minimum safety performance requirements for motor vehicles.

The FMVSS establish performance requirements without dictating design specifications.

It is illegal to market a product that does not conform with an applicable FMVSS or would take a vehicle out-of-compliance with a safety standard (“make inoperative”).
NEW WHEEL STANDARDS

- The Japan Light Alloy Wheel (JWL) standard is a set of requirements for alloy wheels set that must be met for all passenger cars in Japan.

- The JWL mark, cast or forged into the wheel, indicates that the wheel has been self-certified by its manufacturer to meet the standard.

- The Vehicle Inspection Association of Japan (VIA) independently tests wheels for JWL compliance. Wheels that have been tested will bear the VIA mark in addition to the JWL mark.
The federal government's main automotive safety agency, the National Highway Traffic Safety Administration (NHTSA) has no standards or guidelines on the safety of repairing alloy wheels.

As in so many other critical areas of car safety, the agency has not provided advice to consumers on any aftermarket products or issues.
REPAIRED WHEEL STANDARDS

- In the United States, the matter is largely left to industry self-regulation and the decisions of companies about what they will or will not repair.

- Although notably, British Columbia has adopted repair guidelines.
Motor Vehicle Act

B.C. Reg. 5/97

WELD REPAIR OF ALUMINUM ALLOY WHEELS REGULATION

[includes amendments up to B.C. Reg. 140/2003]
Type and nature of repairable wheel damage

10 (1) Weld repair is restricted to the front and rear lip, front and rear rim flange, bead seat and the wheel well areas of an aluminum alloy wheel as shown in Schedule 2.

[Ref: Motor Vehicle Act Reg. Div. 7.09 Schedule, #20, and Weld Repair of Aluminum Wheel Regulation]
REPAIRED WHEEL STANDARDS

Motor Vehicle Act

Type and nature of repairable wheel damage

- 10 (2) Cosmetic weld repair is allowed on the entire wheel, including weld repair of surface nicks and gouges which do not affect the structural integrity of the wheel.
Type and nature of repairable wheel damage

10 (3) If the weld repair supervisor decides that the damaged wheel cannot be safely repaired, the wheel must be discarded and permanently stamped with the word "UNSAFE", using characters not less than 5 mm in height, on the inside of the wheel rim adjacent to the valve stem hole.
VeriFacts Steel / Alloy OEM Wheel Repair Matrix

The following is for informational purposes only. It is believed to be accurate at the time of publication. Subject to change without notice.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Welding</th>
<th>Bending</th>
<th>Hammering</th>
<th>Straightening</th>
<th>Machining</th>
<th>Re-Forming</th>
<th>New Material</th>
<th>Sanding</th>
<th>Polishing</th>
<th>Minor Cosmetic</th>
<th>Finish</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMW / Alloy Wheels</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes, specific guidelines</td>
<td>Yes, specific guidelines</td>
<td>Per BMW Color System Document 01/99. Light alloy wheels w/Sliver -Silver paint- polaris. Arctic silver and rim silver. Bright finished - transparent lacquer spray or pen only. Body Color - Use the products that you know to work. Brilliant finish - there are no means of repairing this finish. Per BMW Color System Document</td>
<td></td>
</tr>
<tr>
<td>Chrysler / Alloy Wheels</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<td>Chrysler Document on Reconditioning wheels. Discard the wheel if beyond surface damage, bent, cracked, or there is corrosion on the wheel. Repairs are limited to paint and clear coat. Paint curing over 200 degrees is not permitted.</td>
<td></td>
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<tr>
<td>Chrysler / Steel Wheels</td>
<td>No</td>
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<td>No</td>
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<td>Ford / Alloy Wheels (includes Lincoln / Mercury)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes, specific guidelines</td>
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<td>Wheel Repair Statement 04/04. Wheel part numbers must match - surface damage only - carefully inspect wheel - discard the wheel if beyond surface damage, bent, cracked, or there is corrosion on the wheel.</td>
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<td>GM / Alloy Wheels (includes 2007 and prior cars and trucks: 2003-2007 Iz; 2006-2007 H3; 2003-2007 Saab 9-TX)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes, specific guidelines</td>
<td>Yes, specific guidelines</td>
<td>Document ID 1841203 surface damage only - carefully inspect wheel - discard the wheel if beyond surface damage, bent, cracked, or there is corrosion on the wheel. Certain wheels require specialty refinishing only.</td>
<td></td>
</tr>
<tr>
<td>Honda / Alloy Wheels (includes Acura)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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VeriFacts Automotive is working with the following manufacturers to obtain their position on wheel repairs: Acura, Audi, Infiniti, Isuzu, Kia, Land Rover, Mazda, Mercedes-Benz, Mini, Mitsubishi, Nissan, Saturn, Subaru, Suzuki, Volkswagen, Volvo
VALIDATION PROCESS THAT HELPED ESTABLISH STANDARDS

- Established Durability Testing
  - *Rotary*
  - *Radial*
  - *Impact*

- Process measure against OEM *new*

- *We* *(Perfection)* have *never* experienced a failure under these established industry standards
Tests conducted per

SAE J328
Passenger Car and Light Truck
Performance Requirements

NOTE:
SAE J2530 establishes performance and marking requirements for aftermarket wheels and rims
Tests conducted per SAE J328
Passenger Car and Light Truck Performance Requirements

Radial Fatigue Summary

Test #

Non-Refurb
R-4178
R-4179
R-4180
R-4181
R-4182
R-4183
R-4184
R-4185
R-4186

Refurb
R-4187
R-4188
R-4189
R-4190
R-4191

SAE Pass  OEM Pass  Beyond normal vehicle life

Cracks observed at end of test
No Cracks
Cracks Observed

Millions of Cycles

Vehicle Lives
Rotary Fatigue Test Summary

<table>
<thead>
<tr>
<th>Test #</th>
<th>SAE Pass</th>
<th>OEM Pass</th>
<th>Beyond normal vehicle life</th>
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</table>

Non-Refurb

Refurb

Cracks observed at end of test

(× 100,000 cycles)

0 1 2 3 4 5 6 Vehicle lives
Comparison of Impact Strength

Meets SAE and OE Crack Criteria

Meets SAE, but not OE Crack Criteria
All incoming cores and restorations are inspected at the beginning of the process to determine reparability, uniformity, and disposition.
Permanent (*Perfection*) Wheel Identification Label. All Parts are Serialized for Traceability.
All wheels are processed utilizing oxide shot that pings the aluminum. It is used as a stripping method, while also adding fatigue strength to the surface.

Any excess paint that did not get removed is removed by a low temp stripping chemical and/or a plastic blast media.
(Perfection) Wheel Repair Guidelines

Inboard & Outboard flange must be within .015 total lateral runout

Straightening
Inboard & Outboard bead diameter must be within .020 total radial runout
(Perfection) Wheel Repair Guidelines

Bent from center is not repairable. When lateral and radial runout exceeds established limits.

Straightening
(Perfection) Wheel Repair Guidelines

Non - Repairable Areas

Repairs never permitted in Lug area, B-Surface or structural Rib area.
Wheel Repair Guidelines

WELDING:

- Circumferential cracks exceeding 6” are not repairable. Circumferential cracks less than 6” on the lip and flange can be welded with proper cutout.
- Cutouts on the inboard and outboard flange may not exceed the radius
- Vertical cracks exceeding the safety hump are not repairable
- All questionable cracks are inspected with dye-penetrant to determine disposition
Not repairable, crack is past the safety hump
6”
Not Repairable
Not Repairable
Not Repairable
Surface Repair
Typical lip and flange repair
Welding

Example of a typical lip weld repair using A356 weld rod. 60% of weld repairs fall in this category.
CNC Milling Operation

- Welds performed on the outer diameter and the inner diameter of the lip and the flange area go to the milling operation

- Excess weld is removed prior to dress and sanding. This reduces the amount of weld needed to be removed at the dress tables and/or the CNC Lathe.
All accent areas that have damage, nicks gouges, blemishes and defects that cannot be removed from the mill or machining process must be dressed to look like the factory finish.

Air tools, die grinders, palm sanders and many different dremels are used to perform the task needed to get the required finish.

All this work is performed in a wet back draft booth for optimum air quality for our operators.
Machining

- All wheels are inspected prior to skim cut, approx. 0.005 to 0.010 is removed on machine-faced wheels.
- Flange thickness is measured and recorded prior to skim cut.
- Flange thickness is measured again after machining and recorded in a permanent record associated with the serial number.
- All wheels that are less than 180 thousandths flange thickness are removed from process.

Note: wheels determined to be under specifications are scrapped and removed from the process immediately.
Machining Process
Final Inspection and Shipping

- All Wheels are (100%) inspected for aesthetics and any potential defect using visual standards, checking Lug Holes, Valve Hole, OD, ID, B-Surface and Pilot Bore.

- Wheels are packaged using a secure pack with locking insert to assure the customer receives product in the condition it was shipped.
VALIDATION PROCESS THAT HELPED ESTABLISH STANDARDS

- Established Durability Testing.
  - Rotary
  - Radial
  - Impact

- Process measures against OEM new

- We (Perfection) have never experienced a failure under these established industry standards.
SUMMARY

- If the refinishing process has defined standards and controls in place and follows these established procedures you should have the confidence of using a Refurbished wheel.

- The industry should demand that all refinishers adhere to manufacturing processes capable of meeting or exceeding OE wheel testing standards.
Thank You!

Questions?
Perfection Wheel

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