The Continuing Need for Collision Repair Information Improvement and Standardization

Jason B. Bartanen
Director, Industry Technical Relations
I-CAR
The I-CAR Vision:

Every person in the collision repair industry has the information, knowledge and skills to perform complete, safe and quality repairs for the ultimate benefit of the consumer.
2,200 STRONG

269 LOCAL COMMITTEES
1,622 VOLUNTEERS
454 INSTRUCTORS
143 STAFF
I-CAR Repairability Technical Support (RTS)

- rts.i-car.com
  - @Ask_ICAR
- Repairability Summits
- OEM & Industry Linking Pin Mechanism
- OEM and Tool and Equipment Technical Advisory Councils (TAC)
Topics

• Material Identification
• Repairability Guidelines
• Standardization and Continued Expansion of Repair Information Types
• Improved Alignment/Standardization of Attachment Methods Used for Collision Repairs
Material Identification

• Key to Repairability
• Important During Damage Assessment and Repair
  – Collision Repairers
  – Insurers
• Easily Accessible
• Need Tensile Strength Identified
### Structure Identification (Hatchback)

#### Body Side

<table>
<thead>
<tr>
<th>Number</th>
<th>Procedure</th>
<th>Material</th>
<th>Material Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Body Hinge Pillar Outer Panel Reinforcement Replacement</td>
<td>Ultra High Strength Steel</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>Body Hinge Pillar Outer Panel Sectioning</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
<tr>
<td>11</td>
<td>Bumper Outer Panel Sectioning</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
<tr>
<td>12</td>
<td>Center Pillar Sectioning - Outer</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
<tr>
<td>13</td>
<td>Center Pillar Replacement</td>
<td>Ultra High Strength Steel</td>
<td>1.3</td>
</tr>
<tr>
<td>14</td>
<td>Quarter Outer Panel Replacement</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
<tr>
<td>15</td>
<td>Body Side Outer Panel Extension</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
<tr>
<td>16</td>
<td>Tail Lamp Pocket</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
<tr>
<td>17</td>
<td>Body Side Outer Panel Rear Upper Extension</td>
<td>M5C Steel</td>
<td>0.65</td>
</tr>
</tbody>
</table>

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Courtesy of GM
Material Identification and Repairability Guidelines

Ultra High Strength Steel

This information provides repair recommendations and general guidelines for steel classified as Ultra High Strength Steel, also known as UHSS. This type of steel normally has a tensile strength of 780 MPa, or greater.

This includes the common steel names of

- Ultra High Strength Dual Phase Steel (DPX)
- Martensitic Steel (M)
- Boron/Press Hardened Steel (B)
- Multi-Phase Steel (MP)
- TRIP Steel (TR)

General Motors recommends the following when repairing or replacing this type of steel during collision repair.

Note:

- Repair of this type of steel is not recommended.
- This type of steel should be replaced only, at factory joints. Sectioning or partial replacement is not recommended.
- The use of heat to repair damage is not recommended for this type of steel.
- Stitch Welding is not recommended for this type of steel (unless replacing a factory installed stitch weld).
- This type of steel should not be used as a weld plate for reinforcing the sectioning location.

Recommended Repairs

- Squeeze Resistance Spot Welding can be used to replace factory spot welds, where applicable.
- MIG plug welding can be used to replace factory spot welds.
- MIG Brazing can be used to replace factory spot welds.

Courtesy of GM
## Repairability Guidelines

### GM Steel Reparability Matrix

<table>
<thead>
<tr>
<th>Steel ID Stamping Symbols*</th>
<th>Grade</th>
<th>GM Specifications</th>
<th>Welding Method</th>
<th>Cold Repair</th>
<th>Use of Heat for Repair</th>
<th>Temp. Range</th>
<th>Maximum Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild Steel Laminar steel</td>
<td>GM6499M (all), GM6C92M (all)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>Up to 1200°F (650°C)</td>
<td>90 sec x 2</td>
</tr>
<tr>
<td></td>
<td>Bake Hardened</td>
<td>GM6099M (all), GMW610(M)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>Up to 1200°F (650°C)</td>
<td>90 sec x 2</td>
</tr>
<tr>
<td></td>
<td>Solid Solution Strengthened</td>
<td>GM6208M (all), GM6Z28M (all), GM532M (HR CR grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>Up to 1200°F (650°C)</td>
<td>90 sec x 2</td>
</tr>
<tr>
<td></td>
<td>High Strength, Low Alloy</td>
<td>GM6208M (all), GM6Z28M (all), GM532M (HR CR grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>Up to 1200°F (650°C)</td>
<td>90 sec x 2</td>
</tr>
<tr>
<td></td>
<td>Dual Phase ≥790 MPA min. UTS</td>
<td>GMW31032M (HR DF and CR DP grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>DPX ≥800 MPA</td>
<td>GMW31032M (HR DF and CR DP grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Dual Phase ≥800 MPA min. UTS</td>
<td>GMW31032M (HR DF and CR DP grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>M</td>
<td>GM6133M (all), GMW3129M (all M5 grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>B</td>
<td>GMW3129M (all M5 grades)</td>
<td>MIG: Yes, RSW: Yes, IG Braze: Yes, NO: No</td>
<td>Yes, Yes, Yes</td>
<td>Yes, NO</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
* Must use 8mm x16mm slotted holes
* Cold repairs can be performed if damage excludes kinks.
* MIG Plug Only, NO STITCH WELDING. These steels may NOT be used as a backer for stitch welding. NOTE: Deviation from this chart is ONLY allowed if there has been a crash analysis completed by the Design Engineer and a Service procedure has been written. NOTE: number values are tensile strength.
* 5G Symbol for repair.

### Ford-Recommended Steel Reparability Matrix

<table>
<thead>
<tr>
<th>Grade</th>
<th>Trade Descriptions</th>
<th>Welding Method</th>
<th>Cold Repairs</th>
<th>Use of Heat for Repair</th>
<th>Temp. Range</th>
<th>Maximum Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Steel</td>
<td>Mid</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes**</td>
<td>Yes</td>
</tr>
<tr>
<td>Laminate Steel</td>
<td>Quiet Steel</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes**</td>
<td>No</td>
</tr>
<tr>
<td>Bake Hardened</td>
<td>BH180, BH 210, BH 250, BH 260</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes**</td>
<td>Yes</td>
<td>Up to 1200°F (650°C)</td>
</tr>
<tr>
<td>Solid Solution Strengthened</td>
<td>HSLA 250, HSLA 350, HSLA 550</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes**</td>
<td>Yes</td>
<td>Up to 1200°F (650°C)</td>
</tr>
<tr>
<td>High Strength, Low Alloy</td>
<td>DP500, DP 600</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes**</td>
<td>Yes</td>
<td>Up to 1200°F (650°C)</td>
</tr>
<tr>
<td>Dual Phase ≤600 MPa UTS (Particular to 750x3500 mm ET &amp; 750x3500 mm ET)**</td>
<td>DP500, DP 600</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes**</td>
<td>Yes</td>
<td>Up to 1200°F (650°C)</td>
</tr>
<tr>
<td>UHSS Manganese Boron</td>
<td>Base Boron</td>
<td>Yes</td>
<td>Yes (plug weld only)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TRIP 500, TRIP 780, TRIP 960</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

** Cold repairs can be performed if damage excludes kinks; may section only if Workshop Manual procedure allows.
** Dual-phase steels: DP 500, DP 600 and DP 960 must be replaced at factory joints; may section only if Workshop Manual procedure allows.
**** Boron components must be replaced at factory joints; no sectioning allowed.

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Courtesy of GM

Courtesy of Ford

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#GDIS | #SteelMatters
New Model Body Technology

BODY CONSTRUCTION AND HIGH-STRENGTH STEEL CONTENT

- Steel parts are color coded based on their tensile strength in megapascals (MPa).
- High-strength steel (HSS) is defined as any steel with a tensile strength of 340 MPa or higher.
- Ultra-high-strength steel (UHSS) is defined as any steel with a tensile strength of 980 MPa or higher.
- Steel repair and welding procedures vary depending on the tensile strength of the parts involved.

Upper View

Magnesium

Aluminum

270 MPa
440 MPa
590 MPa
780 MPa
980 MPa
1,500 MPa

Courtesy of Honda
Reparability Guidelines

1,500 MPa STEEL REAR FRAME (4-DOOR MODELS)
4-door models utilize weight-saving 1,500 MPa steel rear frame rails with soft zones for impact crush control.
- If rear frame damage is suspected, measure the entire vehicle using a three-dimensional measuring system.
- If the rear frame is damaged, replace the affected rear frame(s) as a complete assembly only.
- The traditional replacement of only the rear portion of the frame (Rear Frame B) is not possible because the 1,500 MPa rear frame cannot be sectioned.
- For further repair information, refer to the following:
  - “Repairing 1,500 MPa Steel Parts” on page 7 of this publication.
  - “Rear Floor/Rear Frame Replacement” in the body service information.
Material Identification Uniformity

Steel Tensile Strength Legend

- 270 MPa
- 440 MPa
- 590 MPa
- 780 MPa
- 980 MPa
- 1,500 MPa

Steel Tensile Strength Legend

- 270 MPa
- 340 MPa
- 440 MPa
- 590 MPa
- 780 MPa
- 980 MPa
- 1,500 MPa
Repair Information

• Significant Improvement Over Past 10+ Years
• Majority of OEMs Offering Information
  – I-CAR Working on Closing Gaps
• SAE 2376
Repair Information

Attachment Methods

- Gas Metal Arc Welding (GMAW)
- Squeeze-Type Resistance Spot Welding (STRSW)
- MIG Brazing
- Rivets
- Adhesives
- Flow-Drill Screws (FDS)
- Combination
Tool and Equipment Standardization

• OEM Networks and Testing Challenges
• Significant Investment
  - SPR Gun
  - STRSW
  - Aluminum Welding
  - MIG Brazing
• Specifications vs. Specific Equipment
For More Information

Jason B. Bartanen
I-CAR
920.749.0444 ext. 108
jason.bartanen@i-car.com