

Great Designs in

STEEL 2015!!

Advanced High-Strength Steel Vehicle Collision Repairability

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Who Is I-CAR?

Inter-Industry Conference On Auto Collision Repair

- Not-For-Profit
- Develop and Deliver Collision Repair Training
- Conduct MIG Weld Training and Certifications
- Curriculum Used In 600+ Technical Schools
- 100,000+ Students Taught Annually
- **Train Industry To Follow OEM Procedures**

RTS.I-CAR.COM

The screenshot shows the I-CAR Repairability Technical Support Portal. The top navigation bar includes 'About Us | Contact Us' and a 'my I-CAR' button. Below this is a search bar with a 'SEARCH' button. The main content area is titled 'Ford' and features a Ford logo. It lists several 'NEW!!' items: '2015 F-150 Regular Cab Collision Repair Information', '2015 F-150 Super Cab Collision Repair Information', and '2015 F-150 Crew Cab Collision Repair Information'. A sidebar on the left contains links for 'OEM Information', 'Collision Repair News', 'OEM Partial Part Replacement Search', 'OEM Restraints System Part Replacement Search', 'OEM Hybrid And Electric Vehicle Disable Search', and 'UPCR'. At the bottom of the sidebar is an 'Ask I-CAR' section with a photo of two people and a 'Submit a new collision repair question here!' button. The main content area also includes a 'Ford Collision Repair Website' link, a 'Ford Vehicle Website' link, 'On Target', 'Ford Statements', 'Ford Steel Repairability Matrix', 'Ford Hybrid And Electric Vehicle Disable', and 'Ford/I-CAR Training'. A video player is embedded, showing a video titled 'Accessing Ford Body Repair Manual' with a 'Step-By-Step Instructions' button below it.

- Assist with accessing repair information
- NOT building OEM procedure data base
- We help with information that is available but not always easily found
- Links to OEM sites
- OEM specific pages
- Tech inquiries searchable
- Tech Briefs
- Partial part replacement search

AHSS Structural Repair Factors

- OEM Collision Repair Procedures Are Essential
- OEM support for information gaps/I-CAR Linking Pin
- More partial part/assembly replacement options
- Availability of all parts/Sub-assemblies
- Identification of required materials and equipment
- Design optimized vehicles demand a higher standard of repair - Higher quality joining - Nothing is “overbuilt”

IIHS Small Overlap Test



- More UHSS in side structures
- Require advanced joining
- Less sectioning options
- Larger one piece reinforcements
- Collision repair **MUST** restore original integrity

Courtesy Of IIHS

AHSS Structural Repair Challenges






UHSS B-Pillar reinforcement “kinked”

- Replace to restore original “Shape and State” - **Must not straighten!**
- Outer panel must be removed to access inner UHSS panel factory seams
- More sectioning options for outer panels improves repairability
- Some OEMs have no collision repair information available in the US
- OEM steel identification and repair guidelines **Essential!**

OEM Steel Repairability Information

Recommended GM Steel Repairability Matrix

Steel ID Stamping Symbols ⁴	Grade	GM Specifications	Welding Method			Cold repair	Use of Heat for repair	Temp. Range	Maximum Heat
			MIG	RSW	MIG Braze ¹				
	Mild Steel	GM6409M (all) GMW2M (all)	Yes	Yes	Yes	Yes ²	Yes	Up to 1200 °F (650 °C)	90 sec. x 2
	Laminate steel		NO	Yes	NO	Yes ²	NO		
	Bake Hardened	GM6093M (all) GMW3032M(all)	Yes	Yes	Yes	Yes ²	Yes	Up to 1200 °F (650 °C)	90 sec. x 2
	Solid Solution-Strengthened		Yes	Yes	Yes	Yes ²	Yes	Up to 1200 °F (650 °C)	90 sec. x 2
	High Strength, Low Alloy	GM6208M (all), GM6218M(all), GM3032M(HR CR grades)	Yes	Yes	Yes	Yes ²	Yes	Up to 1200F (650 °C)	90 sec. x 2
	Dual Phase \leq 799 MPA min. UTS	GMW3032M (HR DP and CR DP grades) GMW3399M (HR DP, CR DP and HR HE grades with TS $<$ 800MPa)	Yes	Yes	Yes	Yes ²	No	N/A	N/A
DPX  \geq 800MPA	Dual Phase \geq 800 MPA min. UTS ³	GMW3399M(all other HR DP, CR DP and HR HE Grades)	Yes ³	Yes	Yes ³	No	No	N/A	N/A
M  B 	UHSS ³ Martensitic ³ Boron (PHS/Hot-Stamped) ³	GM6123M (all) GMW3399M (all MS grades) GMW14400	Yes ³	Yes	Yes ³	No	No	N/A	N/A

¹ Must use 8mm x16mm slotted holes

² Cold repairs can be performed if damage excludes kinks.

³ 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

⁴ ISO Symbol for repair.

Note: GM does not endorse repair of door impact beams.

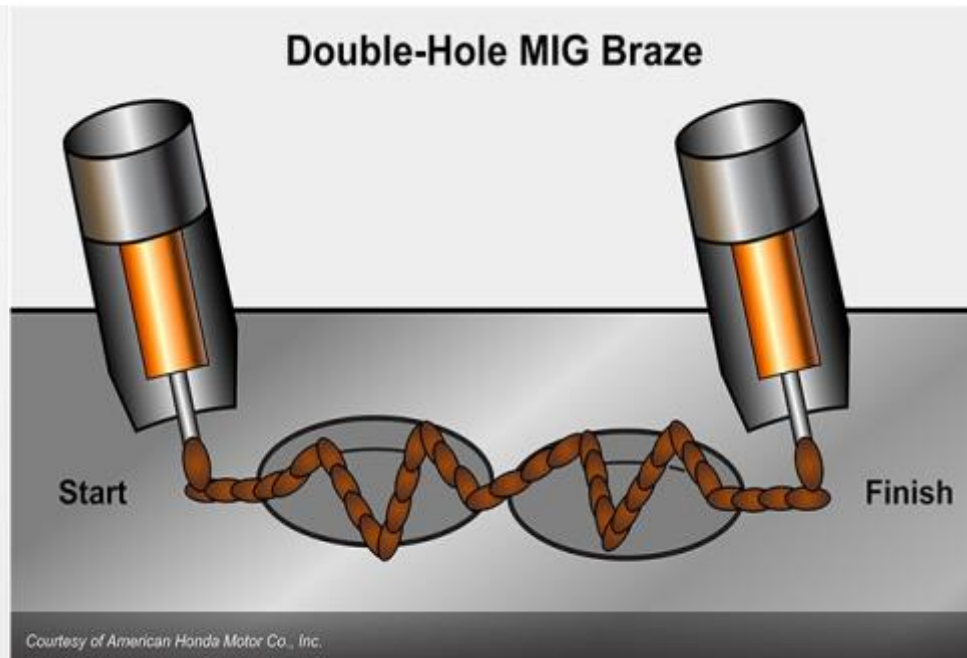
Dual phase Steels up to DP 800 may be sectioned with a sleeve or backer plate.

Outer Side Panel Sectioning - MIG Brazing



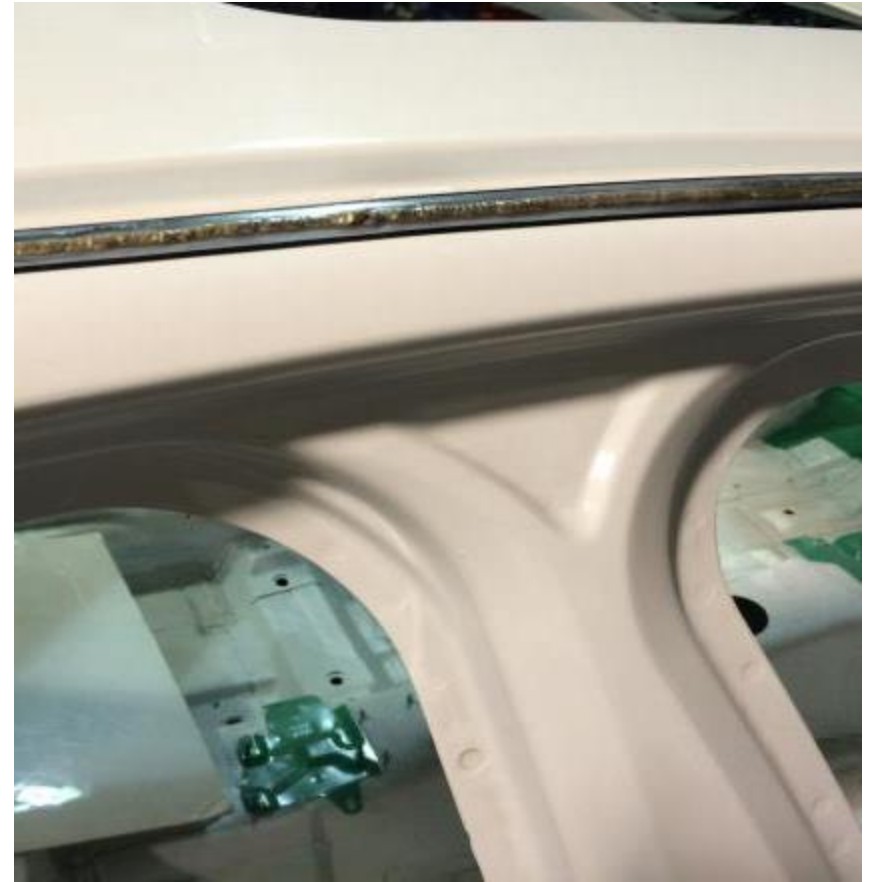
- MIG Brazing joining applications increasing
- Plug, slot, and open butt joints used
- Lower heat input into UHSS structure
- Limited OEM information on technique, equipment, and consumables

Plug and Slot Joints



- May be required to replace OEM spot welds
- May be required where spot welds cannot be made
- Starting and finishing off the joint improves strength
- Pulse transfer mode may be required by OEM - Always check!

MIG Braze Open Butt Joint



- Joins open butt joint with lower heat input into AHSS structure
- Capillary action required for joint strength after finishing

MIG Braze Open Butt Joint



- Short Circuit Mode – More predictable backside bead formation
- Short Circuit not allowed by some OEMs

MIG Braze Open Butt Joint



Front



Back

- Pulse Spray Mode – Backside bead formation more challenging
- Capillary action on open butt joints achievable in pulse with training and practice

Butt Joint Finishing



- Grinding front side bead reduces joint strength
- Requires backside bead for sectioning joint integrity

New I-CAR MIG Brazing and Riveting Courses

- Prepare technicians for repairing the latest AHSS structures requiring these repair processes
- I-CAR seeking OEM input on applications, requirements, equipment, and consumables so the information can be disseminated to the Collision Industry
- Riveting will be more common with the increasing use of mixed materials

Collision Industry Meeting The Challenges



Courtesy ProSpot



- Using OEM procedures
- Upgrading equipment
- Obtaining training
- Becoming capable of:
 - Spot welding
 - MIG brazing
 - Weld bonding/sealing
 - Rivet bonding
- Replacing damaged panels rather than straightening when in doubt

I-CAR Repairability Summits

- Ongoing meetings to discuss repairability issues with advanced materials and design
- OEMs, Steel Industry, Insurance, Repairers, Researchers
- Meeting tomorrow May 14nd at Car-O-Liner in Wixom, MI
- Discussing current and future MIG brazing applications, techniques, equipment, consumables, and training
- For information, contact me at steve.marks@i-car.com