

GREAT DESIGNS IN
STEEL

TWENTY YEARS

**ADVANCED JOINING TECHNIQUES
IN COLLISION REPAIR**

Scott VanHulle

I-CAR

ABOUT I-CAR AND VISION



About I-CAR

I-CAR[®], the Inter-Industry Conference on Auto Collision Repair, is an international not-for-profit organization dedicated to providing the information, knowledge and skills required to perform complete, safe and quality repairs.

Vision

That every person in the collision repair industry has the information, knowledge and skills required to perform complete, safe and quality repairs for the ultimate benefit of the consumer.

WHY THIS INFORMATION IS VITAL

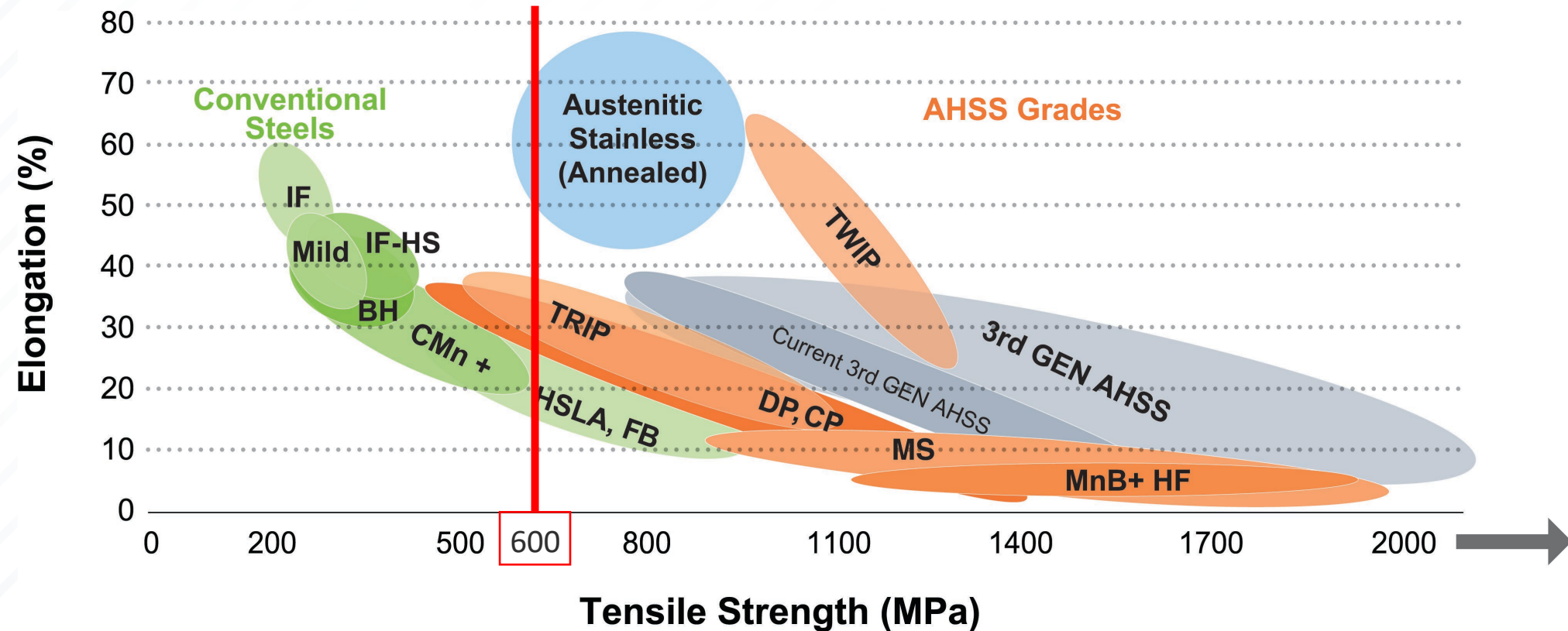
Marcia & Matthew Seebachan - the consumer!



<https://youtu.be/WhilpT13I9E>

REPAIRABILITY IS ALL ABOUT MPa

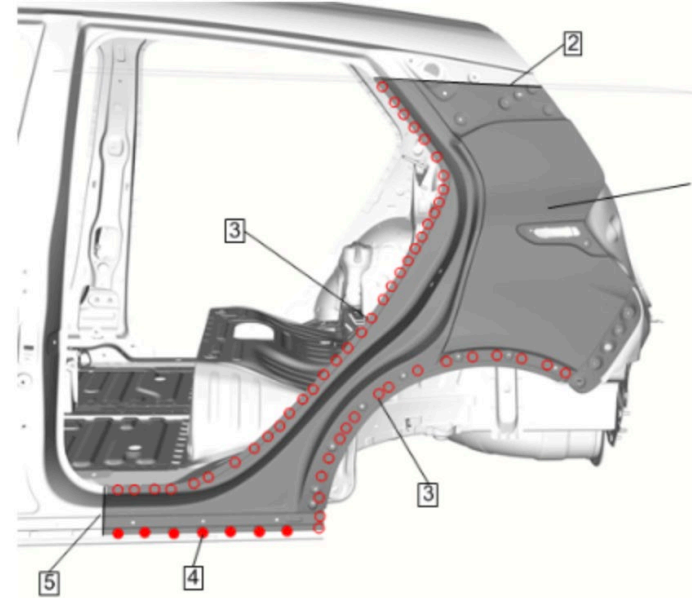
- 600 MPa and higher is not repairable regardless of composition
- Provide repairability documentation for below 600 MPa
- Provide a “do not straighten” statement for over 600 MPa



Source: WorldAutoSteel

MIG/MAG WELDING

- HSS welding wire 980 MPa
- Weld nugget size charts
 - Dependent on panel stack
- Distinct weld symbols
- Used where spot-welding arms cannot reach

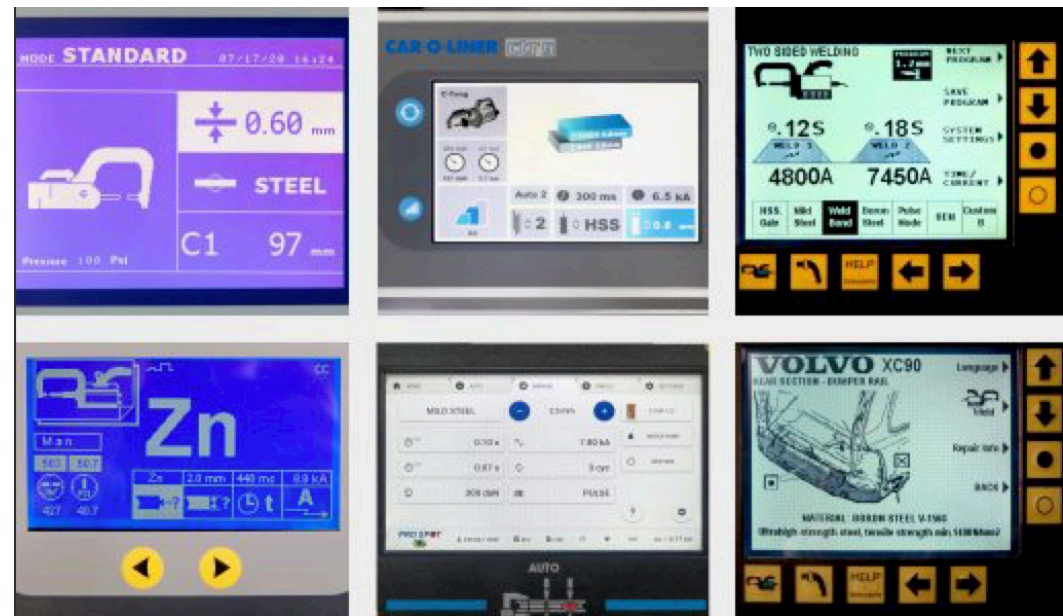
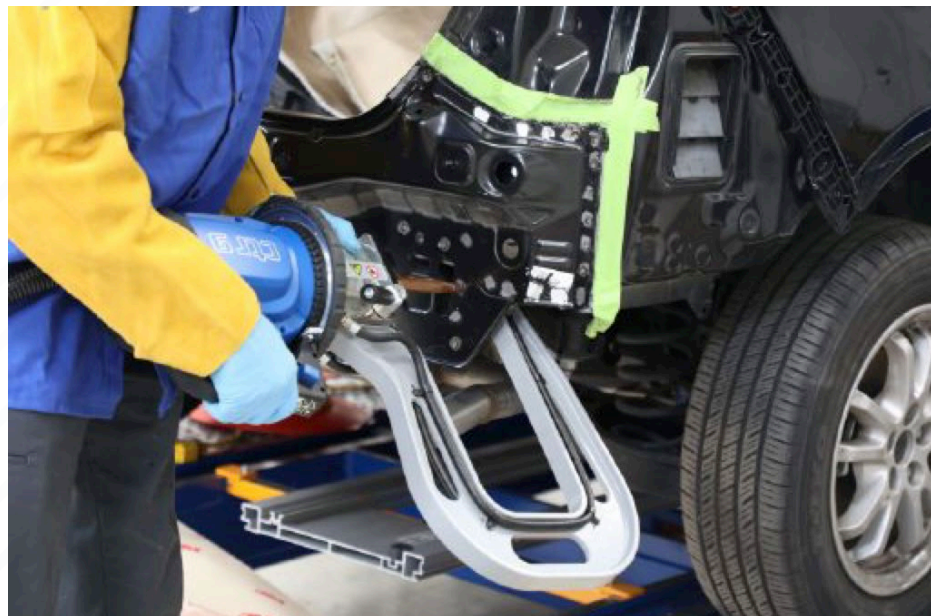


5. Install the quarter panel (1) accordingly.
 - **450 mm** braze seam (2)
 - 53 spot welds (3)
 - 7 plug weld (4).
 - **156 mm** braze seam (5)

SQUEEZE-TYPE RESISTANCE SPOT WELDER (STRSW)

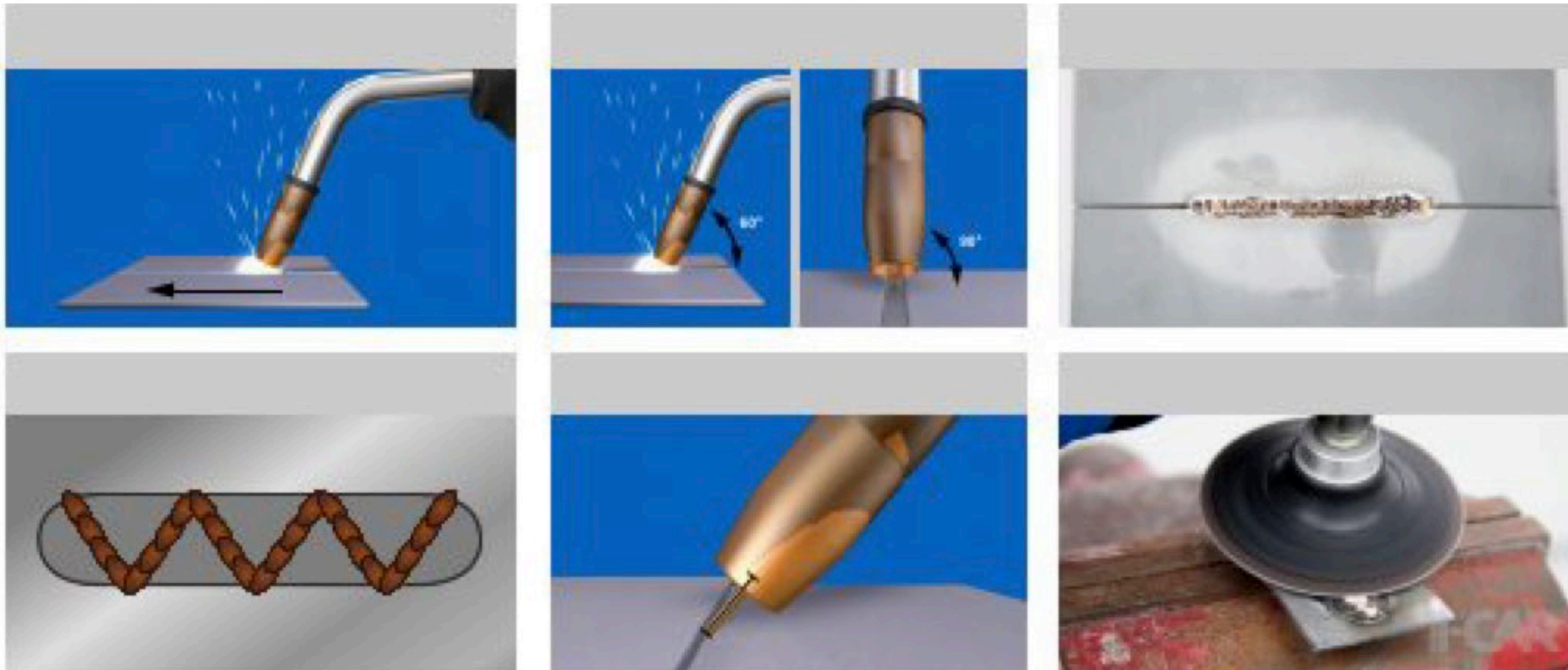


- Some auto set features
 - Specific welder settings on UHSS
- Current generation STRSW
 - 10,000 amps+
 - 990 lbs or 540 daN+ at the tips



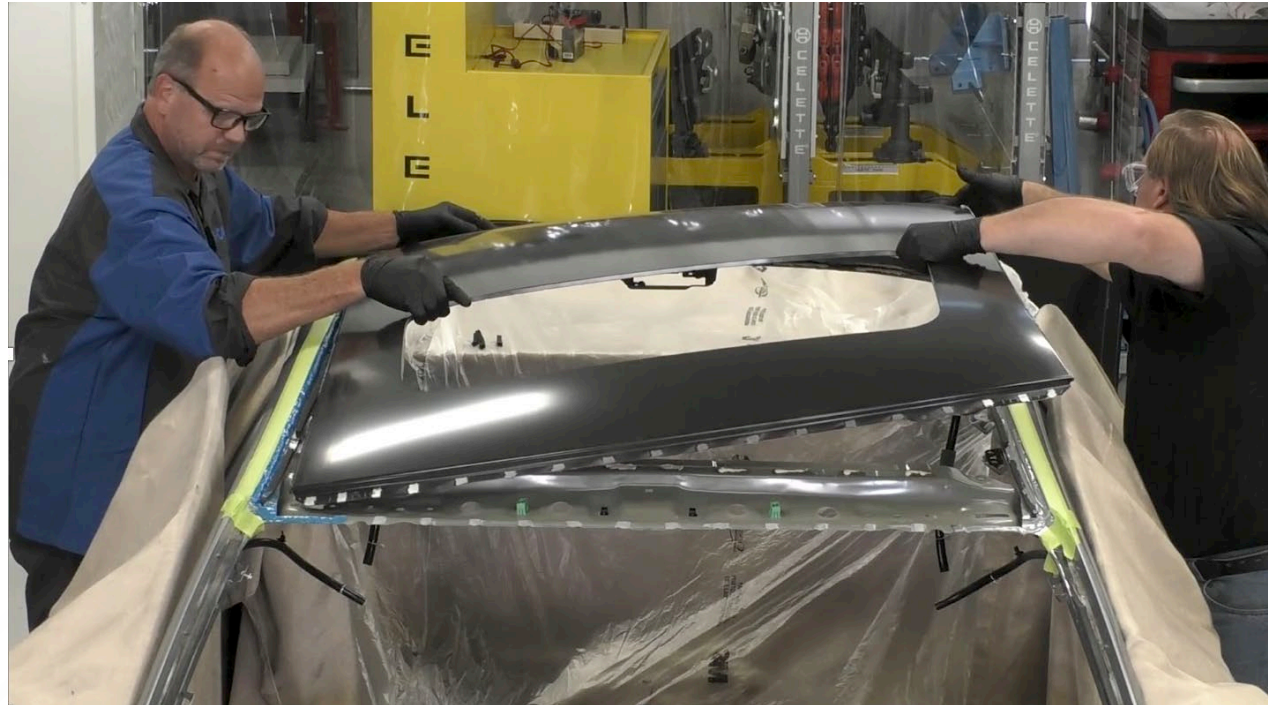
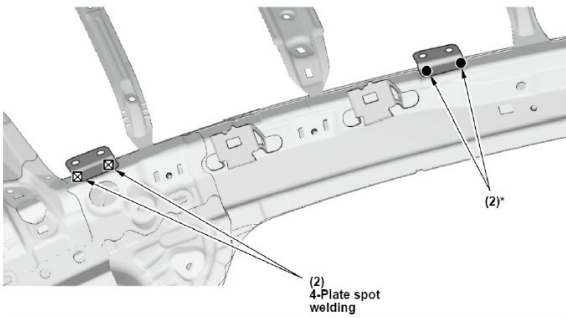
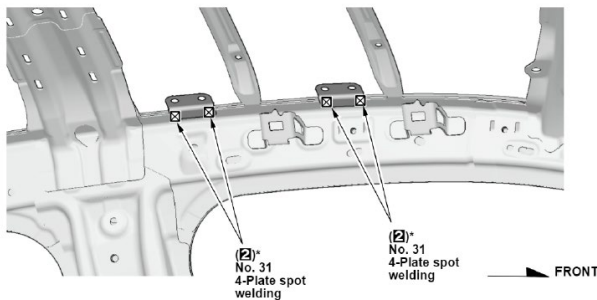
MIG BRAZING

- Pulse capable machines
- Short-circuit and pulse welding currently used
 - Open butt-joint, lap joint, plug, slots, and double hole
- Attachment to UHSS and outer body panels



WELD BONDING

- Weld Bonding
 - Structural Adhesive
 - Panel Bonding Adhesive
 - Urethane Adhesive
 - sometimes used for roofs as a replacement for laser welded/brazed solutions



RIVET BONDING

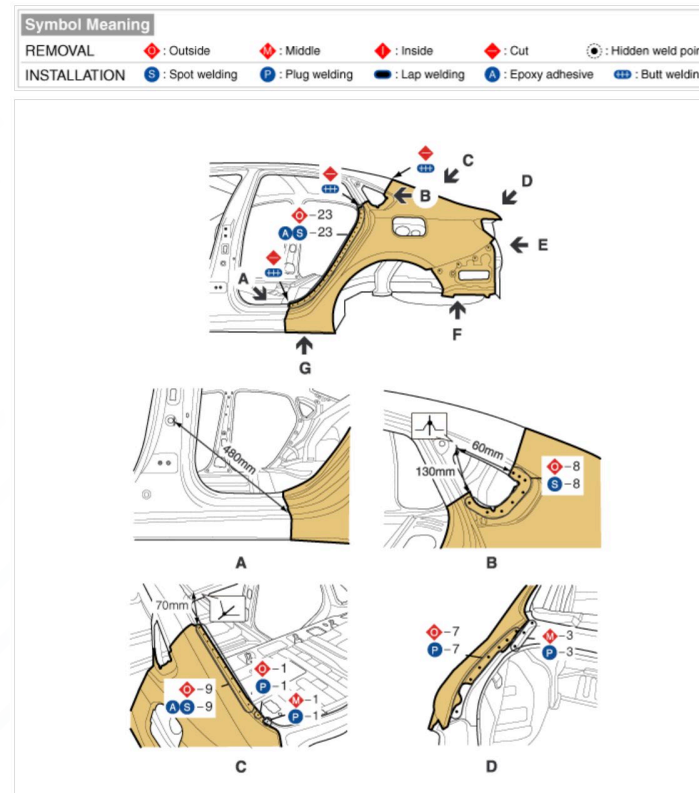
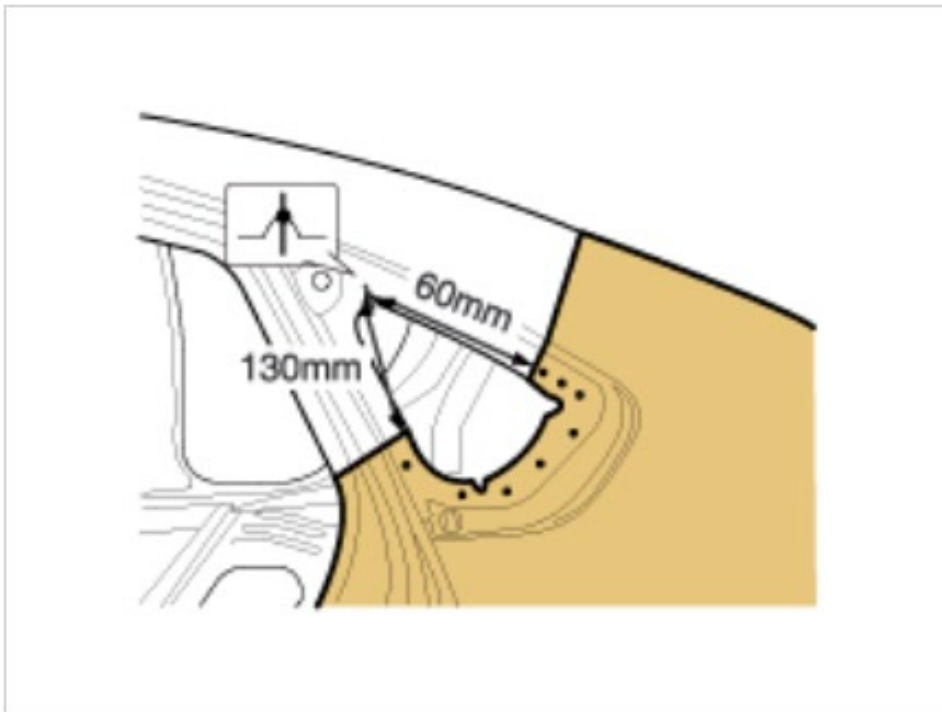
- SPR
 - Repair facilities with this equipment have increased greatly
- Blind
 - Structural rivets
 - Used where STRSW cannot be used and HAZ is an issue



DETAILED REPLACEMENT PROCEDURES



- Exact number of attachment points
- Repair attachment method can be a different method
- The more details that can be provided the better, that is:
 - Which parts need to be removed for access?
 - Can a removed part be reused?



DON'T FORGET ABOUT GENERAL INFORMATION



- Every collision is different
 - Give the collision repair professional guidance
 - Can't be a repair procedure for every situation
 - Can a bracket be removed?
 - Can a tear be welded below a certain MPa?
- Identification of the MPa using a detailed graphic

Honda/Acura Steel Usage and Repairability[†]

Steel Strength	Steel Designation	Cold Straightening	Heat During Straightening	MAG Welding Plug	MAG Welding Butt	MAG Wire Use ***	Possible Sectioning See guidelines	STRSW Spot Weld	Auto-Set For STRSW Acceptable	Mig Brazing to 1500Mpa****	
										Single Hole	Double Hole
270	Mild	Yes	Up to 600° C*	Yes	Yes	E7056	Yes	Yes w/ Zinc Based Weld-through Primer	Yes	Yes	No
340	HSS	Yes	Up to 600° C*	Yes	Yes	E7056	Possible	Yes w/ Zinc Based Weld-through Primer	Yes	No	Yes
440	HSS	Yes	Up to 600° C*	Yes	Yes	E7056	Possible	Yes w/ Zinc Based Weld-through Primer	Yes	No	Yes
590	HSS	Yes	Up to 600° C*	Yes	Yes	Approved High-Strength Steel	Possible	Yes w/ Zinc Based Weld-through Primer	Yes	No	Yes
780	HSS	No	No Repairs	Yes	Yes	Approved High-Strength Steel	Possible	Yes w/ Zinc Based Weld-through Primer	Yes	No	Yes
980	UHSS	No	No Repairs	Yes	Yes	Approved High-Strength Steel	Not Allowed	Yes w/ Zinc Based Weld-through Primer	Yes	No	Yes
1180	UHSS	No	No Repairs	Yes**	No	Approved High-Strength Steel	Not Allowed	Yes w/ Zinc Based Weld-through Primer	NO	No	Yes
1500	UHSS	No	No Repairs	Yes**	No	Approved High-Strength Steel	Not Allowed	Yes w/ Zinc Based Weld-through Primer	Manual Setting Required	Only to 270	To all HSS/UHSS

* Heat may be applied with induction heater, copper stamp, heat gun or similar device: but NO OPEN FLAME
 ** Only as specified in the Body Repair Manual
 *** Based on strength of weaker panel
 **** MIG brazing is only performed where indicated in the Model Specific Body Repair Manual

Plug Hole Diameter

Panel Thickness	< 1mm	1mm - 1.5mm	> 1.5mm
Hole Diameter mm (in)	6.0 (0.24")	8.0 (0.31")	10 (0.39")

Tearout on test plug welds and spot welds should be $\geq 4.5 \times$ Square Root of the panel thickness

Replacement

The welding symbols in the removal/installation have these meanings:
 The welding symbols with dashed lines have a meaning of the spot welding of the part - which is not visible.

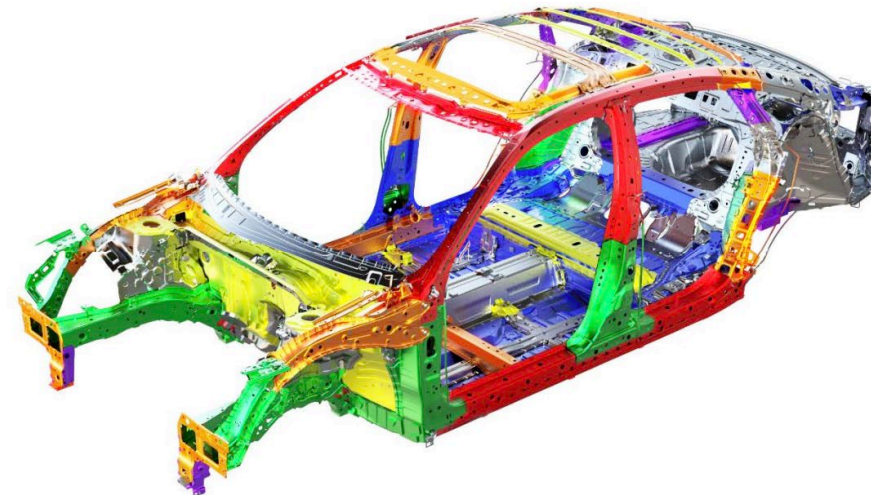
NOTE: To maintain the original body strength and collision safety performance, carefully follow published welding methods. Do not substitute.

- X and Y: 2-Plate spot welding
- ⊗ and ⊙: 3-Plate spot welding
- ⊚ and ⊛: 4-Plate spot welding
- : MAG plug welding
- : MAG welding (butt or fillet)
- ⊕: Double Hole MIG brazing (1500 MPa to HSS/UHSS)
- ⊖: Single Hole MIG brazing (270 MPa to 1500 MPa)

L and L*: Welding length; unit: mm (in)
 () and (): The number of welds

† All information in this document has been compiled from the Honda and Acura Body Repair Manuals and Service Repair Information located at <http://techinfo.honda.com>. Always follow the model specific body repair manuals for detailed repair procedures.

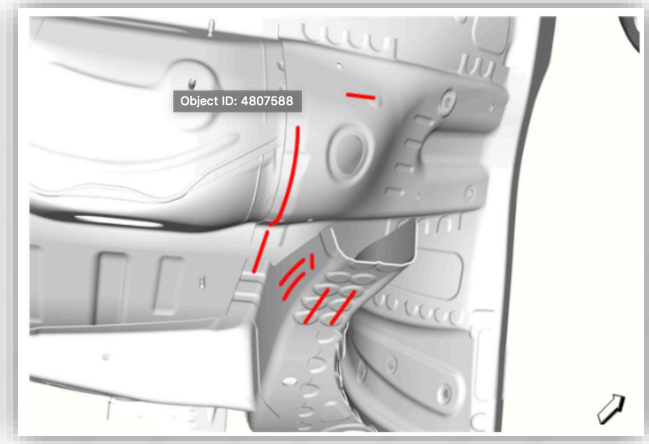
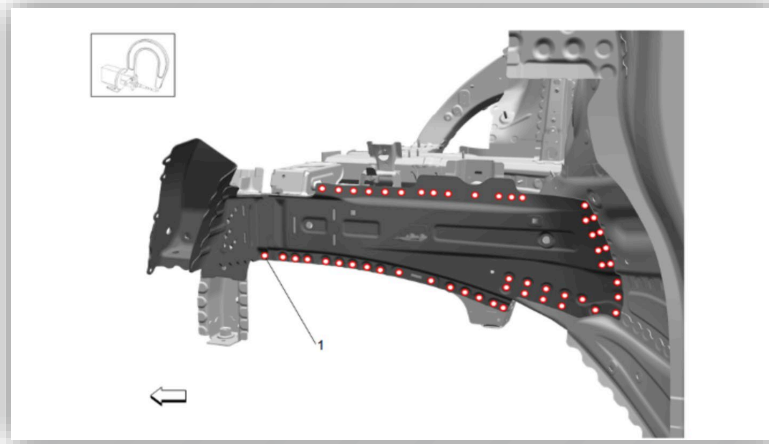
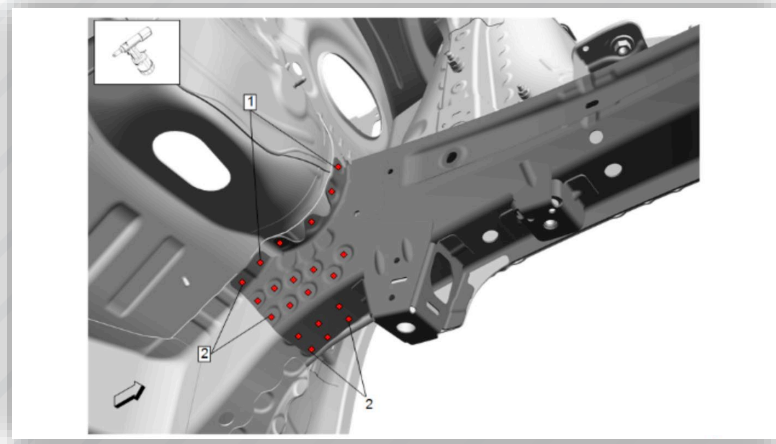
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WHAT DOES THE FUTURE HOLD



- Alternate repair strategies
 - Attachment brackets that hold reinforcements in place
 - Part assembly replacement
 - More adhesive repairs
 - Different fasteners
 - More combinations of all attachment methods



INFORMATION IN TECHNICIAN'S HANDS




- Alternate strategies than traditional path
 - QR code on parts to grant access to procedures?
 - Vehicle graphic that links to the procedure for each part?
 - Apps?
 - Collaborations with various information companies?

- 01: Body and Paint
 - 501-00 Body System - General Information
 - 501-02 Front End Body Panels
 - 501-03 Body Closures
 - 501-05 Interior Trim and Ornamentation
 - 501-08 Exterior Trim and Ornamentation
 - 501-09 Rear View Mirrors
 - 501-10A Front Seats
 - 501-10B Rear Seats
 - 501-11 Glass, Frames and Mechanisms
 - 501-12 Instrument Panel and Console
 - 501-14 Handles, Locks, Latches and Entry Systems
 - 501-16 Wipers and Washers
 - 501-18A Soft Top
 - 501-18B Hard Top
 - 501-19 Bumpers
 - 501-20A Seatbelt Systems
 - 501-20B Supplemental Restraint System
 - 501-25 Body Repairs - General Information
 - 501-26 Body Repairs - Vehicle Specific Information
 - 501-27 Front End Sheet Metal Repairs
 - 501-28 Roof Sheet Metal Repairs
 - 501-29 Side Panel Sheet Metal Repairs
 - 501-30 Rear End Sheet Metal Repairs
 - 501-36 Paint - General Information

Workshop Manual

2022 Bronco



WARNING: Before beginning any service procedure in this manual, refer to health and safety warnings in section 100-00 General Information. Failure to follow this instruction may result in serious personal injury.
Refer to: [Health and Safety Precautions](#)

Service Information

2022 Chevrolet Blazer | [Blazer Service Manual](#) | [Israel, N.America, Other 10, S.America 13532205](#) | [Body Repair](#) | [Collision Repair](#) | [Repair Instructions](#)

Select a Document:

- Front Bumper Impact Bar Anchor Plate Replacement
- Front Bumper Impact Bar Bracket Replacement
- Headlamp Mount Panel Outer Bracket Replacement
- Front End Upper Tie Bar Bracket Replacement
- Front End Upper Tie Bar Replacement
- Front End Lower Tie Bar Support Replacement
- Front End Upper Tie Bar Support Replacement
- Hood Adjust Front Bumper Bracket Replacement
- Front Wheelhouse Front Panel Replacement
- Front Wheelhouse Panel Replacement
- Front Wheelhouse Panel Brace Replacement - Inner (Air Box)
- Front Wheelhouse Extension Replacement
- Front Wheelhouse Panel Brace Replacement (Surge Tank Lower)
- Front Wheelhouse Panel Brace Replacement (Surge Tank Upper)
- Front Wheelhouse Panel Inner Front Brace Replacement (Left)
- Front Wheelhouse Panel Inner Front Brace Replacement (Right)
- Front Wheelhouse Panel Gusset Replacement
- Front Compartment Upper Side Rail Replacement
- Front Compartment Side Rail Replacement (Left)
- Front Compartment Side Rail Replacement (Right)
- Front Compartment Front Side Rail Reinforcement Replacement
- Floor Panel Rear Reinforcement Replacement
- Floor Panel Rear Reinforcement Sectioning
- Body Hinge Pillar Outer Panel Sectioning
- Roof Outer Panel Replacement (Sunroof)
- Roof Outer Panel Replacement (Without Sunroof)
- Roof Outer Side Rail Replacement (Front)
- Roof Outer Side Rail Replacement (Rear)
- Roof Front Header Panel Replacement
- Roof Panel Number 1 Row Replacement (Without Sunroof)
- Roof Panel Number 2 Row Replacement

FOR MORE INFORMATION



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