

TECHNICAL REPORT



THE EVOLUTION OF WELDING MATERIALS, METHODS & PRACTICES -

A FOCUS ON HONDA BODY REPAIR MANUAL (BRM) CHANGES.

Part 1 – MIG Steel Welding / MIG Brazing & Weld-Thru Primers



Several recent enquiries that I-CAR have received for repair procedure interpretations on late model Honda vehicles has highlighted several BRM updates from the vehicle-maker that require further investigation and understanding.

Arguably the most controversial of Honda's updates is the requirement that MIG steel welding wire used on High strength steels for both butt weld joints and plug welds on Honda vehicles matches the tensile strength of the steel being welded.

The most prevalent welding wire specified by the autobody industry globally, is ER70S-6 or ER70S-3, and is called out by numerous OEM's including Japanese vehicle-makers such as Toyota and Mazda, and all of the big three in North America (Ford, General Motors & Chrysler).

Before delving into the differences between welding wires, we need to understand exactly what the ER70S classification means, and based on Honda's weld strength requirements, why it is NOT suitable for steel welding on late-model Honda vehicles that incorporate AHSS.

AWS-ER-70S – EXPLAINED

In the first instance, the "ER" designation is normally preceded with the acronym "**AWS**". This stands for **American Welding Society**, which defines that the product being used is manufactured and supplied in accordance with all AWS standards and specifications worldwide, and will meet the appropriate OEM requirements.

ER identifies that the particular welding wire is an **E**lectrode or **R**od as the filler material.

The number **70** defines the **TENSILE STRENGTH** of the welding rod, measured in imperial units of pressure (**PSI** or **P**ounds per **S**quare **I**nc – and as used in the USA, multiplied by 1000) – therefore 70 X 1000 equals **70,000 PSI tensile strength**.

The letter **S** in the specification identifies that the wire is "solid core" which requires a shielding gas - essentially not a flux core, or gasless wire.

Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 www.rali.co.nz

Cromax

STANDOX

TECHNICAL REPORT



Lastly, we look to the number at the end – this identifies the **chemical makeup** of the wire – and is used to reference preferred applications (Overhead / vertical and down hand positions). - Note that none of these descriptions have anything to do with the thickness or gauge of the welding wire.

When all of this is put together, we typically identify **AWSER70S -3 or 6**, in many OEM specifications, as noted above.



The key difference that Honda are specifying in their **steel welding** requirements on later- model vehicle platforms that incorporate AHSS steels, is that the tensile strength of the welding wire **MUST** match or exceed the tensile strength of the steel being welded.

To save confusion it is best to measure the tensile strength of steels used in autobody manufacturing, by the metric system that most of the world automakers specify, rather than PSI (as used in North America)– that rating is measured in **Mega Pascals** or **Mpa**. The **70,000 PSI** tensile rating of AWSER70S wires, equates to **483 Mpa**.

Therefore the standard welding wire specification (ER70S-), stated by many OEM's, is only capable of welding High Strength Steels (HSS) up to 480 Mpa.

Honda body repair manuals also include a substantial amount of **MIG brazing** – especially on UHSS parts (1500MPa), but may also be specified when joining dissimilar strength steels together.

The MIG brazing process is a **NON FUSION** joining process that requires the correct shielding gas, wire type selection, and joint preparation – this is vital to maintain the integrity of the joint, and minimise the negative effects of heat on the surrounding metals.



Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 www.rali.co.nz



Cromax



STANDOX

TECHNICAL REPORT



Honda's Body Repair News bulletin, published in July last year, clearly states that welding with incorrect materials and/or connection specifications, is a major concern – Lets take a closer look at that document:-



Body Repair News



Applies To: All Models

July 2017

Body Repair Manual Welding & Sectioning Guideline Revisions

(Supersedes original publication, issued August 2016, to change the Tool and Equipment Program phone number)

OVERVIEW

In response to requests from the collision industry as the amount and tensile strength of steels used in our vehicles increase, Honda has made some significant changes to the approved welding methods and parts sectioning guidelines published in the body repair manuals (BRM). These changes will be integrated as each model's BRM is revised. The changes described here apply to all models and supersede previously published information.

WELDING GUIDELINES

Approved Welding Methods (Revised):

MAG butt welding is now an approved repair method for steel parts up to and including 780 MPa.

- The previous limit for butt welding was 590 MPa.
- The table on the right lists approved welding methods.
- To minimize the heat-affected zone (HAZ), butt welds on 780 MPa steel must be done as quickly as possible, while maintaining adequate penetration.
- MAG plug welding is now allowed on 1,500 MPa (hot stamp) steel parts in select locations only as specified in the BRM.
- Welding instructions must be followed exactly as specified to ensure adequate weld strength.

Steel Part Tensile Strength (MPa)	Welding Method		
	Spot Weld	MAG Welding	
		Plug	Butt
<590	○	○	○
590	○	○	○
780	○	○	○
980	○	○	X
1,500	○	○*	X

Welding Methods for Steel Parts
(○ = Approved X = Not Approved)
○* = Approved Only as Specified In BRM

High-Strength MAG Welding Wire Availability (Revised):

- Bosch DS980J solid welding wire is no longer available.
 - The Honda-approved replacement for DS980J wire is 0.8 mm diameter Bohler Union X96, which has a rated tensile strength of 980 MPa (142 ksi).
 - This wire, or an approved equivalent, must be used when doing MAG welding procedures on steel parts from 590 – 980 MPa.
- It may also be used when MAG welding 270 – 440 MPa steel parts.

Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 www.rali.co.nz

Cromax

STANDOX

TECHNICAL REPORT



"Wire tensile strength MUST be equal to, or greater than, lowest tensile strength of parts being welded"

Tensile Conversion Chart

Steel Tensile (MPa)	Wire Tensile (ksi)
590	≥86
780	≥113
980	≥142

(1,000 psi = 1 ksi)

780 MPa
- 483 MPa
296 MPa

~300 MPa Tensile Strength Spread = UNACCEPTABLE!



A summary of Hondas revised MAG steel welding requirements outlines :-

- Bohler Union X96 is the only Honda approved wire for High Strength & Ultra High Strength steel welding procedures on 590 to 980 Mpa steel parts, including:
- MAG butt welding on up to 780 Mpa steel parts
- MAG plug welding on up to 980MPa steel parts

Revised 1500 Mpa MAG plug guidelines:

- ONLY approved in BRM specified locations
- Requires larger 10mm holes
- MUST use 980Mpa welding wire (0.8mm diameter)
- Weld in a spiral motion from the outer edge inward

Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 www.rali.co.nz

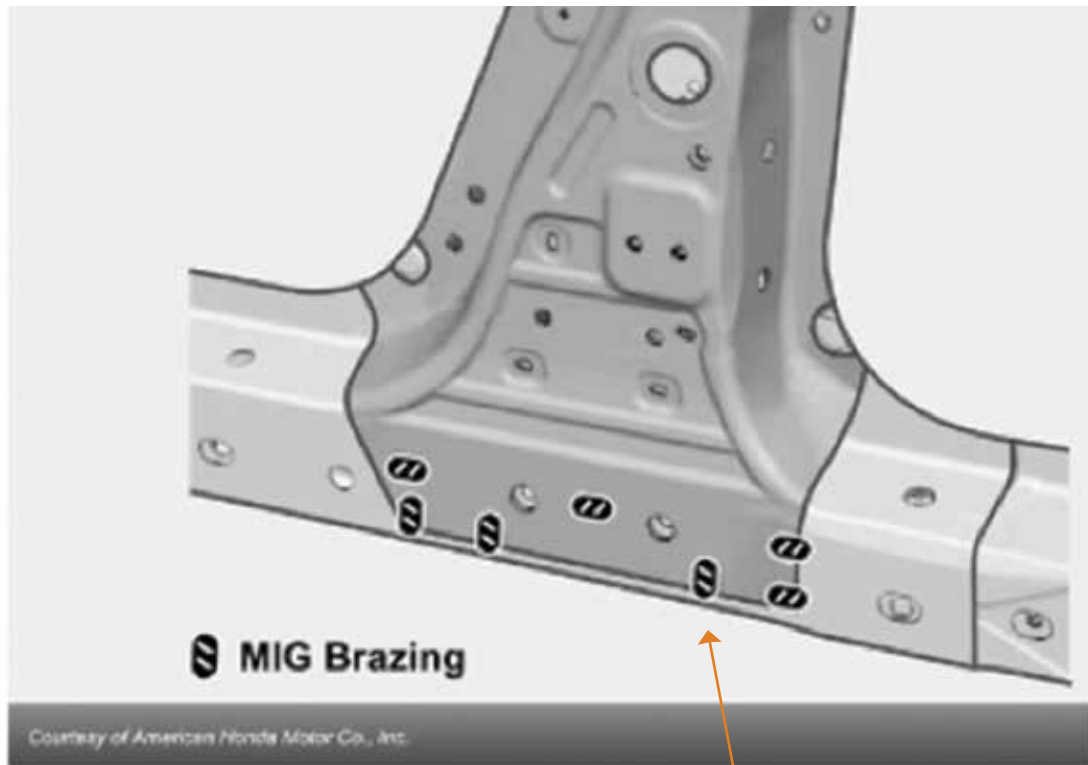
Cromax

STANDOX

TECHNICAL REPORT

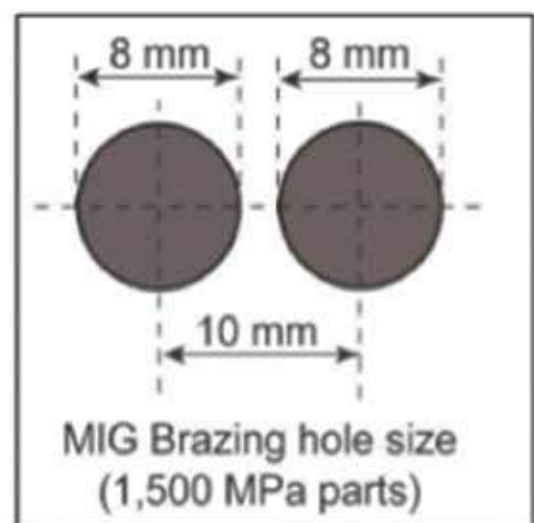


MIG PLUG BRAZING 1500 MPA PARTS TOGETHER (ACCORD B PILLAR SHOWN) :-



MIG BRAZING IS SHOWN AS A SLOT SHAPED SYMBOL IN THE BRM....

BUT is actually 2 X 8mm Drill holes that maintain a 2mm distance apart, as seen here :-



Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 www.rali.co.nz

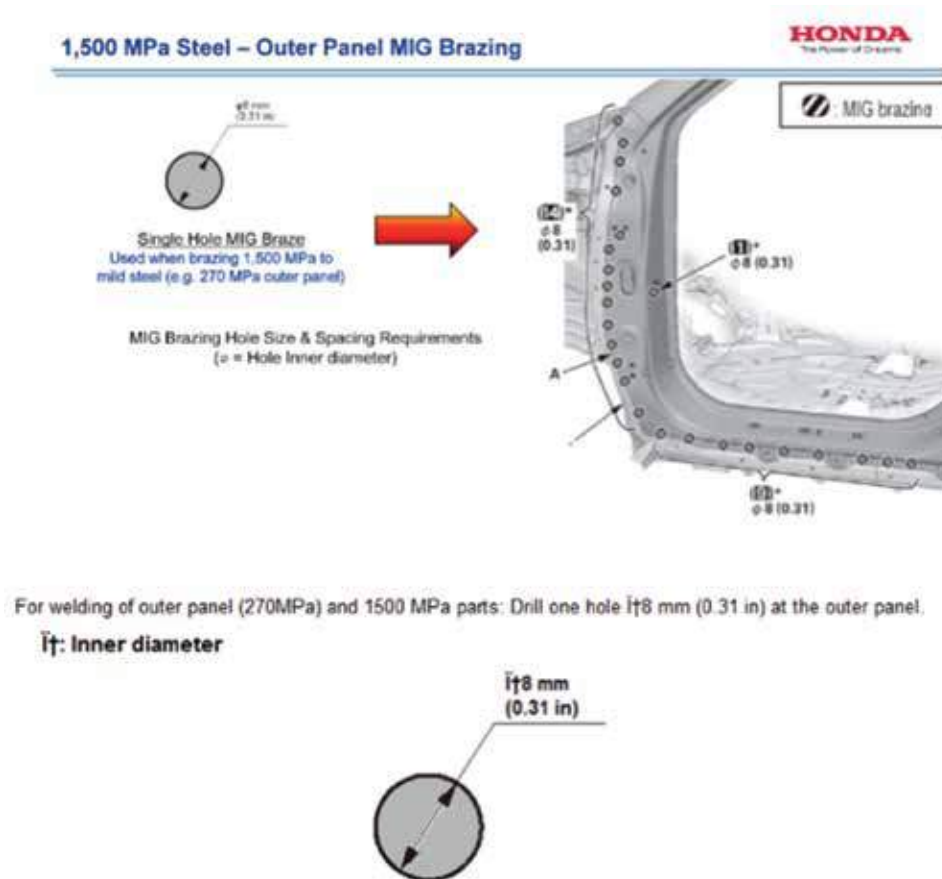
Cromax

STANDOX

TECHNICAL REPORT



MIG PLUG BRAZING MILD STEEL OUTER PANELS TO 1500 MPA REINFORCEMENTS :-



SUMMARY OF MIG BRAZING WIRE REQUIREMENTS (REVISED):

- Required MIG brazing wire is silicon bronze (ERCuSi-A or CuSi-3) - 0.8mm diameter.
- The specified silicon bronze wire is commercially available.
- Requires 100% Argon shielding gas.
- 8mm diameter single holes for plug welding mild steel outer panels to 1500Mpa parts.
- 2 X 8mm holes, 2mm apart (not slotted) for joining 1500 Mpa parts together.

These articles have been written by Martyn Lane : I-CAR Instructor, Weld Test Administrator and Technical Specialist to the auto body industry

Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 www.rali.co.nz

Cromax

STANDOX