Keeping up with new construction methods and repair techniques

Compiled by

Robert

Renwick

CRA

I-Car course

coordinator

"When will we see the U.L.S.A.B. (Ultra Light Steel Auto Body) and all these new steels - like Boron and when will Aluminium be used more for vehicle body shell structures".

Well if you are still waiting, you may have missed the boat because it's here and has been in many models since 1999/2000.

No matter where I go around the country I hear it, comments that someone has heard that these new steels and alloys are coming but it won't affect us as we don't work on that sort of vehicle.

As the average life of a vehicle is around 10 years, this new vehicle technology will have been used by many manufacturers for 5 years come 2005. The chances are you'll see one real soon! In addition to this, just look at the fleet of second hand European vehicles coming into the NZ market and that's where it's happening. The European market is perhaps ahead of many in other parts of the world on using these new methods of construction, they are using these new steels and aluminium or a combination of both.

The European manufacturers are also very good in supplying information to the collision repair industry on what considerations are required when repairing their vehicles.

I choose for this issue of PanelTalk to look at Citroen, a vehicle not so commonly known to our industry. I was pleased to find that vehicle specifications were well presented and an additional specification sheet was provided that overviewed precautions when repairing their vehicles. An example of this is the 2000 C5 Citroen as featured below. You might say you will never see one of those in my shop - well the company is huge in Europe producing more than 1.3 million vehicles last year. When researching this article I was reminded that they also won the Manufacturers and Drivers title in this year's International Rally. So now expect to see more of this brand in NZ and in addition I am sure that the Japanese market will be purchasing these also which will ultimately end up in NZ as second hand imports.

BODYSHELL

Figure 1. U.L.S.A.B. body shell (simulation).

2 - RULES TO BE APPLIED IN BODY REPAIR

2.1 - Resistance Welding

Resistance welding is the principle method of assembly used in the manufacture of steel car bodies. Resistance welding is the principal assembly method for use in repairs (if possible).

Respect the spot weld diameters recommended for the different panel thicknesses.

The adjustment parameters for resistance welding machines are identical whatever the kind of panels. Panels that are zinc-coated or protected with weldable primer require a current slightly stronger than is necessary for bare panels.

IMPERATIVE: Gas welding and brazing are assembly solutions that must not be used whatever the composition of the panels. Should access not be possible using the resistance welding gear, use MIG or MAG welding.

2.2 - Protection of panels prior to welding

The interior faces of non-coated panels should in any case be protected with weldable primer before assembly.
Use recommended primers.

2.3 - Partial replacement of components

Respect the cutting and assembly procedures as set down in the repair manuals.

3 - HIGH STRENGTH STEEL PARTS (HSS)

3.1 - List of components

Front side sills.
Rear side sills.
Absorber mountings.
Bulkhead crossmember strenthener.
Lateral bulkhead crossmembers.
Front wing inner panels.
Suspension mountings.
Half-panels.
Front tunnel strengthener.
Front seat front crossmembers.
Front seat rear crossmembers.
Front interior longerons.
Front inertia reel fixing mountings.
Rear seat backrest support strengtheners.
Front sidemembers.
Rear seating crossmember.
Rear centre seat belt stiffener.
Rear tank support.
Rear floor lateral strengtheners.
Rear absorber fixing mating plates.
Rear sidemembers.
Jack mountings.
Centre pillar strengtheners.
Roof bar mounting points.

3.2 - Repairs

3.2.1 - Assembly

High strength steels pose no special problems for assembly using MAG or MIG resistance welding.

3.2.2 - Straightening

High strength steel (HSS) panels can be beaten virtually identically as ordinary steel panels.

IMPERATIVE: Hot straightening, which creates local weakening and may possibly lead to breaking, especially in thick structural parts, is prohibited.

3.2.3 - Precautions to be taken

Carry out cold straightening only.
Give back the exact form, paying particular attention to angles and to the edges of the structural parts such as longerons, side sills, cross members... (any trace, even slight, of a fold is a weakened area).

IMPERATIVE: When these recommendations cannot be respected, the part must be replaced.

4 - BORON STEEL COMPONENTS IN VERY HIGH STRENGTH STEEL (VHSS)

Steels used in manufacture of very high strength steel (VHSS) components are hardened steels which cannot be machined with conventional tools used in bodywork.

4.1 - List of components
Structural parts:
LH and RH windscreen pillar inner panels.
Detachable components: bumper frames.

4.2 - Separation of the welding seams
Use only milling tools that are ground specifically for separating welding seams.

WARNING: Conventional tools used for separating welding seams do not work on VHSS panels (including where separation involves one non-VHSS panel).

NOTE: In the event of difficulty in separating windscreen pillar inner panel (VHSS) welds, they should be destroyed by grinding.

4.3 - Cutting of panels
Use exclusively power-cutting discs (no metal saw can cut this type of material).

4.4 - Resistance welding
Criteria for weld spot diameters are the same as those for other steels (in the absence of any special requirement).
The adjustment of the electrical power for welding VHSS panels is the same as for other steels.

WARNING: By reason of the extreme hardness of VHSS panels, it is essential to take all viable measures to ensure the panels are pressed together: use the highest lightening pressure that is available on your machine.

4.5 - End-to-end welding
Assembly by end-to-end welding bead in prohibited whatever the welding means (including MIG and MAG) by reason of the very great loss of resistance in the hating zone close to the bead.

4.6 - Partial replacement of a VHSS panel component
We recommend complete replacement of the component whenever possible.
A partial replacement is only possible where assembly involved overlapping of 30 to 40 mm panels: assembly of the panels must be by two lines of resistance spot welds.

4.7 - Straightening
It is not possible to cold-straighten VHSS panels.

IMPERATIVE: Straightening when cold or after reheating is strictly forbidden as it results inevitably in a resistance loss of at least 50%. This resistance loss is irreversible.

5 - COMPONENTS IN ALUMINIUM

5.1 - Classification of aluminium alloys
Belonging to eight families, aluminium alloys are many and various in their composition, properties and uses. Classes from 1000 to 8000: each manufacturer uses a part reference alluding to class and composition.

5.2 - Hardening method
There are the following hardening methods:

* work-hardened alloys: classes 1000, 3000, 5000 and 8000

* alloys structurally hardened: classes 2000, 4000, 6000 and 7000

5.3 - Classes of aluminium used in car bodies
Structures: class 5000
Exterior components: class 6000
Bonnet C5:

* the exterior panel is in type 6016 aluminium: class 6000
* the inner panel is in type 5754 aluminium: class 5000

5.4 - Straightening aluminium panels
Reshaping:

* during reshaping operations, take all useful precautions to avoid stretching of the metal, as aluminium is more prone to this than steel.*
do not use panel beating tools which are hard or edged (steel hammer), but use soft materials (wood, plastic or aluminium)* in the case of aluminium, straightening should commence at the centre of the deformed area (as opposed to steel panels)
Smoothing out
* in the smoothing out phase, manoeuvre the striker and dolly carefully to avoid stretching of the metal
* it is possible to shrink back areas of metal by local application of heat

WARNING: Maximum heat for maximum shrinkage of the metal: 1500C

IMPERATIVE: Use only an oxyacetaline flame.

IMPERATIVE: Use of a carbon electrode is prohibited.

Check the temperature:

* in the absence of any existing visual guide marks, we advise use of thermal markers
* marks made on the panel using a thermal marker in the heating zone change colour when the temperature is reached

5.5 - Aluminium welding using MIG
It is possible to weld aluminium using a MIG welding station that is specifically adapted for this metal type.
Some welding stations permit MIG welding of steel and aluminium as well as brazing, with the exchange of following equipment:

* wire coil
* torch, cable and supply sleeve assembly
* welding wire rollers
* gas bottle (pure argon)

5.6 - Sanding and smoothing
Smoothing by the use of abrasive discs requires special precautions to be taken in the case of aluminium .

IMPERATIVE: Never use any abrasive that has been used on ferrous metals. Ferrous particles remaining on the surface of abrasives that has been used on steel, risk becoming encrusted in the aluminium.

Ferrous particles encrusted in aluminium can cause a weblike corrosion that spreads below the film of paint.

6 - PAINT

6.1 - Paint primers
Paint primers that can be used on aluminium:

* chromo-phosphate undercoat
* epoxy primer

These products can also be used on steel.

WARNING: Paint primers that have been used on steel during the last fifteen years no longer contain chromates and therefore cannot be used on aluminium.

Chromates are paint additives and are toxic.

IMPERATIVE: It is essential to wear a breathing mask when using paint primers containing chromates.

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