Metallisation
Thermal spray equipment and consumables

PRODUCTION REPAIR OF AUTOMOBILE BODY PRESSINGS & ASSEMBLIES

Application Data Sheet AU-ST-001

INTRODUCTION

Automobile body pressings are susceptible to various types of minor damage during production, handling and whilst creating sub assemblies.

Metal Spraying using the Metallisation Arc Process provides a fast, reliable and economic solution to repair these pressings.

1. Typical Areas where repair is required prior to painting:

1.1. Roof & Quarter Panel Sub Assemblies: (See Fig 1)

Weld defects & misalignment.

These sub assemblies are created by manually welding the joints using MIG Silicon Bronze.

The weld area is then 'dressed' by hand using disc sanders. Typical defects which frequently emerge following the 'Dressing operation are: voids, pits and low spots due to misalignment. **(See Fig 4)**

1.2. Roof & Quarter Panel Sub Assemblies to Wings: (See Fig 2)

Exactly as for 1.1. above

1.3. Door & Body Panels:

Door & Body pressings prior to strengthening by sub assembly are relatively weak due to the small gauge sheet which is used.

Damage to these components during pressing and subsequent handling frequently occurs and rectification may fall between scraping the panel or an expensive solder repair procedure.

Typical Body Pressing defects Are:

- A concave surface caused by overheating.
- Indentations caused by inadvertent Knocks to the panel.
- Tears caused by the stretched material opening at its weakest point.
- Slippage in the overlapping sheet stretched over a door panel.

1.4. Window Frame Joints. (See Fig 3)

Window Frame Joints are the pressings which are MIG welded to the roof assembly. Following welding the areas are manually 'Dressed' using disc sanders and the typical defects which may be exposed are the same as those for the Roof & Quarter Panel sub assemblies, voids, pits & misalignment. **(See Fig 4)**

Current Method of Rectification.

Where possible manual soldering techniques are used to repair the types of defect described above. This method which has been the industry standard for many years has been technically satisfactory although it is labour intensive, time consuming and not easy to automate.

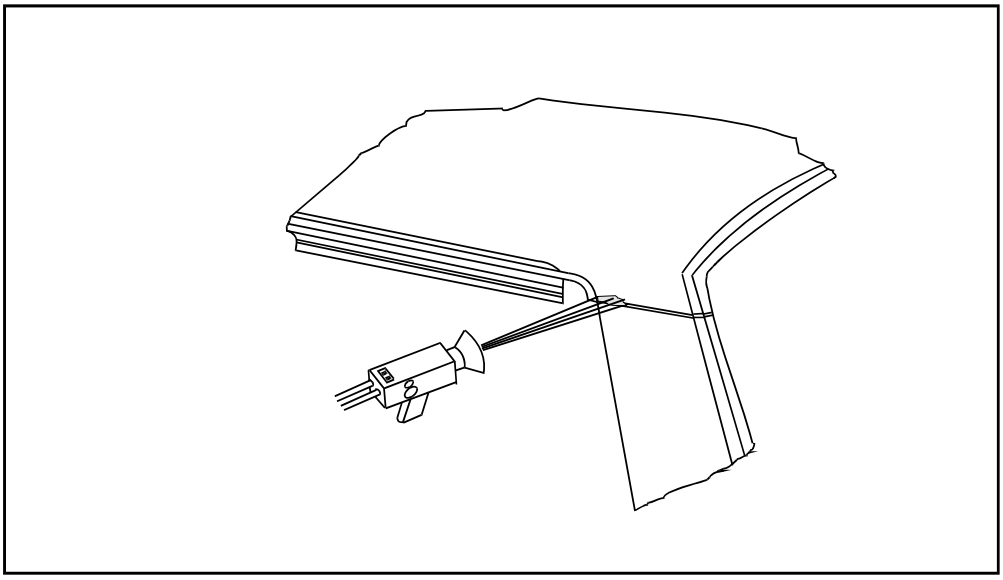
2. Defects which may occur following painting:

During the paint curing operation areas which have been repaired by soldering may show further defects.

These are caused by gas inclusions in the solder which will expand due to the curing temperature causing a blistering effect.

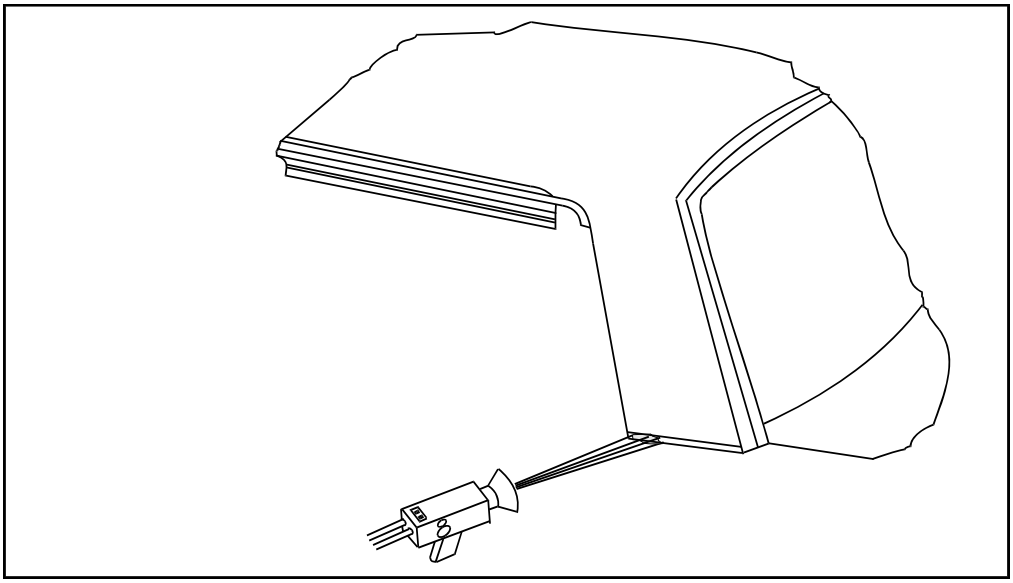
Current Method of Rectification.

When this occurs the area is rubbed down, filled and refinished



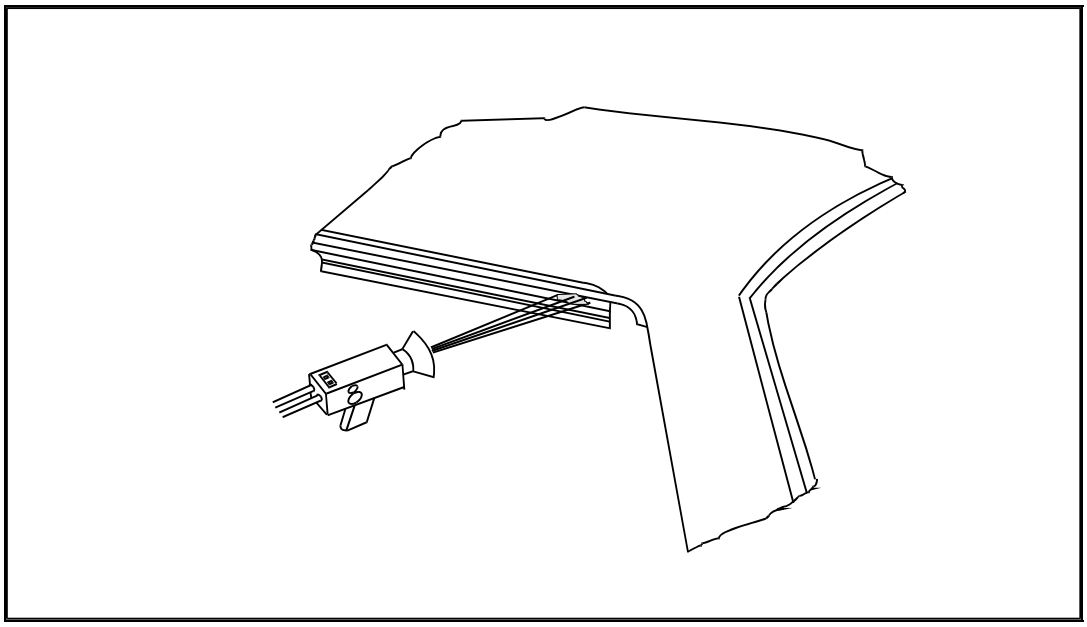
Roof & Quarter Panel Sub Assy

Fig 1.



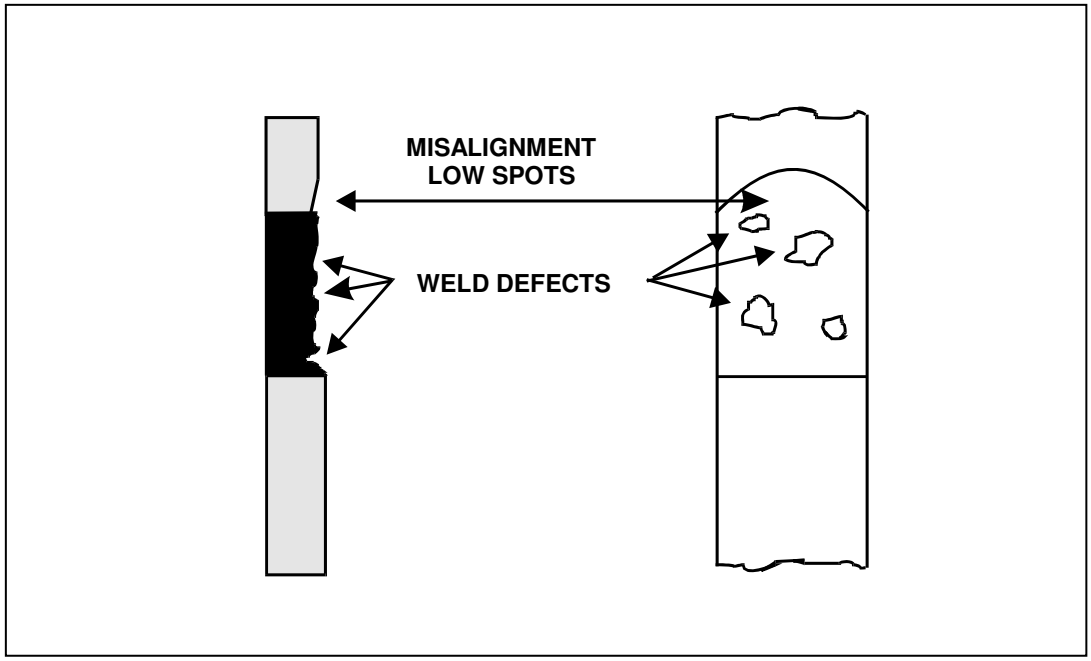
Roof & Quarter Panel Sub Assy to Wings

Fig 2.



Window Frame Joints

Fig 3.



Weld Defects & Misalignment

Fig 4.

MATERIALS

Procedure for Repair by Arc Spraying.

Process Specification:

Preparation:

1. Prepare the surface by rough grinding to blend any misalignment of high/low spots. **See (Fig 5)**
2. Grind weld area to remove any weld debris and to blend to an even contoured surface.
3. Ensure that the defect area to be sprayed is roughened, clean, dry and free from any loose matter. Do not handle the area to be sprayed.

Defect before Preparation	Defect after Preparation

Fig 5.

EQUIPMENT

For manual operation : Metallisation Arc 140 or 340 Pistol with S250 Energizer.

For automated operation: Metallisation Arc 528 Pistol with S250 Energizer.

Main Deposit

Metallisation 120T Wire 1.6mm Dia. This specialised wire is a Copper / Tin Alloy specifically manufactured for this application.

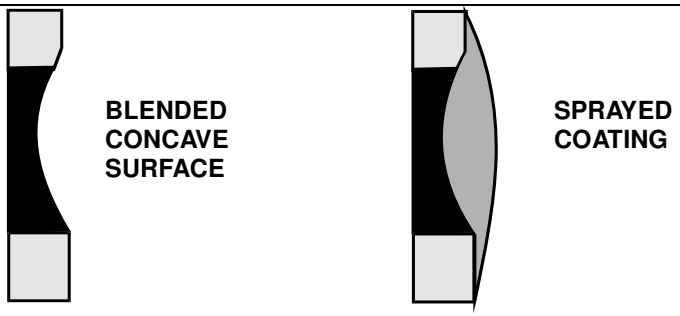
Coating Properties	
Melting Point	1050°C (1920°F)
Bond Strength	28mpa (4000 - 4250psi)
Coating Texture	
microinches aa	100 - 250
microns aa	2.5 - 6.25
Hardness Rockwell	Rb 28 - 30
Coating Density	7.6gm/cc (90%)

Application of Sprayed Coating

1. If the defect area is small it is sometimes advantageous to spray through a mask which serves to reduce the amount of overspray to the adjacent area.

2. Coating thickness:

   Ensure that the coating forms convex surface and feathers out to the non defect area. A finishing allowance of 0.8mm (0.032") is usually sufficient.



Defect before Spraying	Defect after Spraying

Spraying Parameters:

(i)	Range	:	100 – 150mm (4"-6")
(ii)	Nozzle Air Pressure	:	4.13 bar (60 psi)
(iii)	Voltage before spraying	:	33V
(iv)	Voltage during spraying	:	30V
(v)	Amperage	:	100A

Note: Parameters may differ in accordance with type and length of power cables being used.

Costing Data	
Spray Rate	4.0 kg/hr (9 lb/hr)
Coverage Rate	1.1kg/sqm/100 microns (0.56lb/sqft/0.010″)

Finishing

The spayed coating may be finished by disc sanding to produce a smooth contour blended to the adjacent area.

Cautionary Notes:

1. A spayed metal coating will not impart any structural strength to the component. If, for example a body panel is torn then the affected area may have to be backed up with a suitable material prior to spraying.

2. **'E' coat.**

   Electrocoating Deposition, commonly known as 'E' coat is probably the most widely used method of applying paint finishes to high volume production line components.

   Components are conveyorised through various pretreatments to an 'E'-Coat dip tank where the paint finish is deposited.

   There are two forms of Electrode position:

(a). Anodic Electrocoating where the component to be painted is the Anode.

(b). Cathodic Electrocoating where the component to be coated is the Cathode.

   Both methods are widely used by industry for applying paint finishes to parts ranging from car bodies and associated items to domestic appliances and office furniture.

   Insofar as car bodies are concerned it would appear that Cathodic Electrode position is now the most widely used since the migration of metallic irons into the paint is minimised and corrosion resistance improved.

   It is important to ensure that the type of 'E' coat used is compatible with the sprayed coating.

   For example PPG Industries 'E' coat is suitable whereas Dupont™ 'E' coat is not compatible

   If the sprayed coating shows slight signs of porosity after finishing the area can be sprayed with a chip resistant paint.

PAINTING PROCESS

1. Cleaning

2. Phosphate crystal build. Etches metal and zinc crystals build up on the steel. Looks like frost and it increases the surface area for bonding of the paint. The crystals do not build up properly on copper alloys, but they will adhere well enough for a salt spray (scab) test.

3. E. Coat: This is a water based epoxy. They use a charged build up to give uniform cover of the whole body. Typically, 0.001" 25μm thick. The thinner the better.

4. Oven 325°F (163°C) for ½ - 1 hour.

5. Inspection and filler scuffing

6. Sealer deck where the boot and wheel arches are sealed

7. Spot spray: Covers colour changes and fills

8. Sealer bake: 20 minutes at 250°F (120°C)

At this point, the process can go one of two ways:-

	First (and worst)		**Second and best way**	
9a.	Colour 1st coat	9b.	Primer surfacer	
ia.	Colour 2nd coat	ib.	Oven	
iia.	Clear	iib.	Inspection	
		iiib.	Colour	)
		vib.	Colour	) All done wet
		vb.	Clear	) on wet

11. **Finishing**

a) 7" disc	6000 rpm	36 grit	Hardback
b) 7" disc	6000 rpm	50 grit	Hardback
c) 7" disc	4000 rpm	100 grit	Soft pad
d) Orbital	80 grit	For Finishing	

12. Try soaking panels in alcohol, acetone or methylated spirits. This may displace the water and reduce popping.

13. Butylproposol works when used before the phosphate and wash, but it is oily and does not soak in well. Consequently, it is only partially successful.

15. We now recommend the arcbeam for best results. However, it does mean an extra hose and more weight on the gun.

16. Using a robot is recommended as the best way to get consistent coating quality.

GENERAL POINTS

1. Two American Manufacturers use a dip undercoat which is also a filler. They are having the most success, but they also use a primer surface step after the sealer bake.

2. An American Manufacturer is investigating a powder coat primer surfacer. This gives 100% success on trial coupons. Body then goes in to colour. This must not be applied onto "Green" E Coat. The E Coat must be fully cured.

3. It is the water that soaks into the coating during phosphate and wash that causes the popping. Once it gets into the oven it steams and expands, popping the E coat, which has already partially cured so that it won't flow back over the blemish.

4. A "closed" joint is worst for popping. There is no escape for the water/stream except up through the E Coat.

5. An "open" joint is better for popping as the water has an escape route through the joint.

6. Antichip paint is good on the sprayed area if applied after the E Coat bake. This is often in the system for use on sills.

7. The thinner the E coat is applied, the better from the point of view of subsequent popping.