9.1 Repair of defective welds

If inspection (X-ray, ultrasonic etc.) reveals unacceptable weld imperfections then the weld must be repaired.

On material under 4 mm thick, defective areas can be removed with a rotary tungsten carbide cutter mounted in a pneumatic drill. The axis of rotation of the cutter must be parallel to the axis of the weld so as to avoid incipient cracks.

For material over 4 mm thick, the defective areas should be removed with a pneumatic hammer fitted with a gouge (25).

The weld is then repaired by the same process (TIG or MIG) as was used to make the initial joint.

Minor imperfections are nearly always repaired by TIG welding however, thickness allowing.

(25) Carbon arc gouging is not advisable as it may introduce carbon into the weld seam.

(26) Cf. Chapter 10, Section 10-2.

CHOICE OF FILLER METALS AS A FUNCTION OF THE ALLOY COMBINATION

Each combination has three possible choices -indicated where the lines intersect -depending on the selected criterion: Optimum mechanical properties: top line – Optimum resistance to corrosion: middle line – Optimum weldability: bottom line
The filler metal indicated is: 4: series 4xxx → 4043A, 4045, 4047A – 5: series 5xxx → 5356, 5183, 5556A

Alloy A					
Wrought 5000 Series Mg < 3%	5 5 (a) 4 - 5 (b)				
Wrought 5000 Series Mg > 3% (a)	5 5 5	5 5 5			
Wrought 6000 Series	5 - 4 5 4	5 - 4 5 4	5 - 4 5 4		
Wrought 7000 Series without copper	5 - 4 5 4	5 - 4 5 4	5 - 4 5 4	5 - 4	
Cast Si > 7% (c)	4 (e) 4 4	5 - 4 (e) 5 4	4 4 4	4	4 (d) 4 4
Alloy B	Wrought 5000 Series Mg < 3%	Wrought 5000 Series Mg > 3%	Wrought 6000 Series	Wrought 7000 Series without copper	Cast Si > 7% (c)

Table 52

(a) 5000 series alloys with more than 3.5% Mg are sensitive to intergranular corrosion when exposed to temperatures over 65°C and when used in certain aggressive environments (26).

(b) 5000 series alloys with less than 3% Mg and 3000 series alloys that contain magnesium may be sensitive to hot cracking.

(c) The mechanical performance of the weld depends on the internal soundness of the castings. Gassed materials and injection mouldings are considered to be non-weldable.

(d) The percentage of silicon in the filler wire must be as near as possible to that in the casting.

(e) The welding of aluminium-silicon castings (40000 series) to 5000 series alloys should be avoided where possible as Mg_2Si intermetallics form in the weldment and weaken the joint.