DESIGN NOTES AND SPECIAL CONSIDERATIONS FOR ANODISING

It is important to take into consideration at an early stage that surface coatings are an integral part of a design.

Suitable integration of surface coating requirements into the original design can save time, money, and effort. It is also far more likely to produce the optimum final product performance.

It is essential to start with a good quality substrate, substantially free of sharp edges, crevices, deep re-entrants and blind holes if practical. The alloy may also have a major effect on the final quality of the finishing. Mixed alloys in particular can lead to problems.

It is important that the requirements and keys design features are discussed with us so as to avoid unnecessary complications.

CONTACT POINTS

In most coating processes it is necessary to have contact points to support the components during treatment. In some cases, such as in painting or autocatalytic plating, a hanging point is sufficient but in electrochemical processes, such as plating and anodising, electrical continuity is also essential. Residual contact marks usually result.

Whilst the contact points will usually be situated where they are not easily visible, they may cause a reduced local coating thickness. It is important therefore that the contact point is made, as far as possible, on non significant areas and that drawings or clear instructions as to contact points and significant surfaces are supplied.

FABRICATION

Any necessary forming should be as far as practical, carried out prior to surface coating. This prevents subsequent damage to the coating and, with particular respect to anodising, avoids cracking of the film and subsequent risk of a reduction in corrosion resistance.

Welding too must be carried out prior to coating, ensuring that the correct filler rod and welding technique is used to minimise the heat affected zone. A lack of care at this stage will, for instance, result in unsightly dark patches on the anodised component. Mechanically fixed assemblies involving bolts, rivets or screws are, however, best anodised prior to assembly so as to guarantee such things as good electrical contact throughout the article and reduce the risks of solution entrapment.

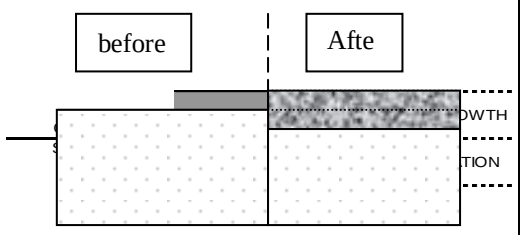
DIMENSIONS

All applications of coatings affect the dimensions of the items being processed to some degree. If the coatings are thin (i.e. less than 10 microns) or the application is not dimensionally critical, then this effect can be ignored. But in high build up processes or on highly engineered components allowances should be made.

In plating and painting, the dimensional allowance is that of the coating thickness per face. In the case of anodising however, the allowance is approximately 50% of the coating thickness per face. See Diagram opposite. In all cases this does not include any allowance for any special etching or cleaning requirement.

If the dimensions are critical then additional machining allowances or masking of the components should be considered.

Illustration of the dimensional change typically seen following anodising.



~50% of the film is below the original surface and ~50% is above.

CONFIGURATION

Surface coating is carried out in corrosive liquids. It is important therefore to consider the shape of the parts to be coated because solution entrapment or air locks can cause a loss in product quality.

SHARP EDGES

In general, sharp corners can give rise to edge cracking. It is important therefore, where possible, to radius the sharp corners and edges. A radius of 10 times the required thickness is usually considered to be necessary. For particularly severe conditions of service, a radius of 30 times the thickness may be more appropriate.

CHOICE OF MATERIALS

Aluminium produced in rolled, extruded, drawn, cast and forged form in purities ranging from less than 90% to 99.9%. All these alloys will anodise but there can be a marked difference in response according to composition, thermal history and the production techniques employed in manufacture. Quite often the choice of material is dictated by the form and end use of the component and not the finish required. It is recommended however, that for the best results, due consideration should be given to the Aluminium alloy and the finish required.

The table below gives a brief guide to the suitability of the more common alloys.

Particular attention must be paid to alloy choice in parts to be hard anodised as both the thickness attainable and the natural colour are alloy dependent with this process. Natural hard anodised films vary from almost colourless on some 6000 series alloys through to grey/green on high copper alloys (2000 series), to grey/black or grey brown on high silicon alloys and castings respectively.

As a general rule, the more highly alloyed the Aluminium, the more difficult it will be to anodise.

ALLOY TYPE	**TYPICAL SPECIFICATION**	**NORMAL FORM**	**SUITABILITY FOR ANODISING**			
			Protective Sulphuric	Dyed Sulphuric	Hard	Chromic
1000 series (pure Aluminium)	1200 (S1C)	sheet	V	V	V	V
2000 series (Aluminium-Copper alloys)	2014A(H15)	sheet, forging, plate extrusion	F	D	G	G
3000eries (Aluminium -Manganese alloys)	3103 (N3)	sheet, plate	G	G	G	G
5000series (Aluminium Magnesium alloys)	5005 (N41)	sheet	V	V	V	V
	5083 (N8)	sheet, forging, plate extrusion	V	V	V	V
6000 series (Aluminium- Magnesium-Silicon alloys)	6063 (H9)	extrusion	V	V	V	G
	6082 (H30)	sheet, forging, plate extrusion	G	G	V	G
7000series (Aluminium- Zinc alloys)	7075	sheet, forging, plate extrusion	F	F	G	G
Cast Aluminium-Magnesium	LM5	Cast	V	V	V	V
Cast Aluminium-Silicon	LM4 LM25	Cast	G	D	G	F
Cast Aluminium-Silicon	LM6 LM20 LM24	Pressure Die Cast	F	D	L	F

V = Very Good G = Good
F = Fair D = Fair but dark colours only
L = Limited Film Thickness

We would welcome the opportunity to discuss any of the above details.

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