DESIGN FOR PARTS WHICH WILL BE VITREOUS ENAMELLED

It is very important to design parts which will be vitreous enamelled with the nature of the process in mind.
At all stages it is important to ensure that stresses which may be raised during the firing operation are minimised. Remember that the parts will be heated and cooled to a temperature in the region of 800 degrees Celsius each time the article is fired, and this may be repeated a number of times depending on the final requirements.
Vitreous enamel is a glass and is very strong in compression but weak in tension. This is one of the major considerations in the design of parts which will be coated with vitreous enamel and this principle is one of the major controlling factors in good design.

The specifications applicable to vitreous enamelling are available in the sections on Standards

We give below some general principles:

SHEET METAL PARTS

1. Corner radii should be as generous as possible and for sheet steel certainly not less than 3 times the material thickness. For example with 1mm steel, the minimum internal radius should be 3mm minimum. This also applies to corner radii. Where welding is involved on corners then the corner must be dressed to achieve this.
2. Brackets attached to sheet steel by welding should be of thinner material than the main part.
3. Where flatness is very important, then the part should be coated on both sides.
4. Where gas or TIG/MIG welding is carried out care must be taken with selection of the correct filler rod. This should be as near as possible the analysis of the steel used for the component. Your welding materials supplier will be able to assist with this.
5. Where welding is carried out it, should ideally be placed away from a corner (see examples). Where this is impossible, then great care must be taken with preparation, weld technique and after dressing.
6. With electric resistance (spot or seam) welding is carried out care should be taken to prevent overheating of the joint and of entrapment of contaminants.
7. Only steel of the correct specification designed for vitreous enamelling should be used - see Steel Specifications for Vitreous Enamelling. The correct grade for the proposed application should be selected with care. Help will always be available from the steel supplier.
8. Specific examples of poor and preferred design are shown in Design for Vitreous Enamelling - Sheet Metal Parts.

CAST IRON PARTS

1. All radii should be as generous as possible and should be a minimum of 4mm external. This applies not just to corners, but also bosses, ornamentation etc which will be coated.
2. Care should be taken to ensure as constant a section thickness as possible, avoiding heavy bosses, using careful design of ornamentation and changes in s shape.
3. Care must be taken with design to ensure that larger sections are not fed during casting through a thinner area. This will lead to porosity or even shrinkage in the thicker area.
4. Specific examples of poor and preferred design are shown in Design for Vitreous Enamelling - Cast Iron Parts.