

Corrosion - not a problem, more an opportunity

In explaining that corrosion is a more complex issue than many may have thought Mark Salmon points out the opportunities that exist both to safeguard your customer's interests and improve your bottom line.

Corrosion is one of those subjects which is often given scant attention at the time of installation but which may rear its ugly head a few years down the line. As usual the objective of this article is to make those selling fixings into construction applications aware of the pitfalls which in this case can be regarded as opportunities to give your customer a better service and improve your bottom line at the same time.

Before going into any detail it's worth just dispelling a couple of myths about different levels of corrosion protection. The first of these is that the basic level of protection offered by most manufacturers, namely zinc plating (with or without a chromate passivation) provides a significant level of long term protection. In anything other than dry internal conditions it won't.

The second of our myths is that stainless steel in grade A4 is the ultimate protection that will cope with any corrosion environment. This is also not true. For particularly aggressive conditions A4 stainless steel will still corrode and a special stainless alloy is recommended.

There are five main levels of corrosion protection currently offered for construction fixings: Zinc plating, hot dip galvanising, Grade A2 stainless steel, Grade A4 stainless steel and special stainless alloys. So when should you recommend each of these and which should you stock?

[Let's work through the five levels of protection listed above to see when each may be considered.](#)

Zinc (electro)plating is a sacrificial coating, usually between 5 and 10 microns (μm) thick, and sacrifice it will.

In very dry atmospheres it will oxidise and the oxide coating will protect the zinc from further corrosion but in the presence of moisture and air it will corrode to zinc carbonate - often referred to as white rust - which will be blown away or washed away by rain and in time will disappear. A chromate passivation, which may be yellow or "blue" (which looks clear), protects the zinc plating from the chemicals present in cardboard cartons to keep the product in good condition until the time of use. So for long term protection in anything other than dry internal conditions a higher specification of protection is needed.

Hot Dip Galvanising (HDG) is the next level up - just a thicker coating of zinc, in the order of 50 microns, so it will last longer but eventually in any damp or humid conditions the coating will disappear. This level of protection is generally considered suitable for external exposure in rural and urban environments for up to ten years and in coastal or industrial environments for two or three.

Note: Zinc electroplating is sometimes referred to by manufacturers based in continental Europe as "Galvanising" but should not be confused with HDG - if in doubt check the thickness.



Fixings underwater may be less vulnerable than...



...fixings in the splash zone...

Coatings are vulnerable. It is worth remembering that any externally applied coating such as electroplating or HDG is vulnerable to being scraped off during insertion into the hole in the substrate especially with anchors such as throughbolts where the anchor is hammered into the concrete. The removal of the plating on the expander clip or tapered cone will lead to rapid corrosion if water ingress takes place. This corrosion is happening in the worst place and is another reason why zinc plated throughbolts should not be considered for long term external use.

Stainless steels. There are now effectively three grades to consider; two regularly available and one often only to special order.

Starting with the lowest corrosion resistance Grade A2 (contains chromium and nickel) is suitable for long term use in most external applications where no heavy pollutants or chlorides are present i.e. rural and urban locations. Although A2 may not "rust" in these situations it may stain so if used on exposed decorative applications it may eventually look unsightly. A4 is next up and contains molybdenum in addition to chromium and nickel. It will not stain in exposed situations and can be considered for use in virtually all external applications including industrial and coastal areas - even totally immersed in sea water but not in the splash zone where special





...while fixings overhead here? Relax - don't think about it!

stainless alloys should be considered. Most manufacturers supply a choice of both grades with an appropriate cost saving on A2 but some, in order to standardise and to cover the maximum range of applications, concentrate on A4.

More manufacturers are now offering a selection of anchors made from a special alloy of stainless steel which has higher proportions of the above added elements and carries the reference DIN 1.4529. This type of stainless steel copes with most aggressive environments, including the splash zone of sea water. Aggressive environments include use in chemical plants where the specific chemicals need to be considered individually.

There are other corrosion conditions to consider: galvanic corrosion, stress corrosion cracking, and crevice corrosion. Most specifiers are aware of galvanic corrosion (sometimes referred to as bi-metallic corrosion) which is the accelerated corrosion of one metal (the less noble) when dissimilar metals are in direct contact in the presence of an electrolyte e.g. rain water. This is a complicated issue not given to a summary treatment but two examples are worth considering. Galvanic corrosion will cause the accelerated rusting of mild steel brackets if fixed with stainless fixings or the faster rusting of steel fixings if used to fix a stainless bracket. Neither is desirable but the latter is potentially more serious

because a) the effect is related to the relevant areas of the two metals so the smaller fixing will rust dangerously quickly and b) the fixing is critical to the security of the bracket and any corrosion will put the whole assembly at risk. Avoidance is achieved by not mixing different metals or by isolating the two electrically with suitable washers and sleeves (harder than it sounds).

Stress corrosion cracking is an insidious effect which is hard to detect. It affects components under stress in the presence of chlorides at elevated temperatures. Fixings in swimming pool roof spaces are the obvious example. Even grade A4 stainless is susceptible to this effect so the special stainless alloy to DIN 1.4529 is recommended.

So which finishes should you stock?

Obviously this will be affected by your customer base and the demand they generate but zinc plated steel alongside grade A4 stainless steel will cover the vast majority of applications with HDG and special alloys being supplied to special order when necessary.

More detailed investigation of the corrosion aspects of your customer's applications could well lead to an increase in the level of protection supplied which will safeguard his liability and should be more profitable for you.