Malzeme Seçimi

The life expectancy of a cable support system is dependent on the environment in which it is placed. Therefore, it is important to establish the corrosive properties of an environment to ensure that the right treatment and the right material are chosen.

All metal surfaces are affected by corrosion. Depending on the physical properties of the metal and the environment to which it is exposed, chemical or Electromechnical corrosion may occur.

Atmospheric Corrosion:

Atmospheric corrosion occurs when metal is exposed to airborne liquids, solid or gases. Some sources of atmospheric corrosion are moisture, salt, dirt and sulphuric acid. This form of corrosion is typically worse outdoors, especially near marine environments.

Chemical Corrosion:

Chemical corrosion takes place when metal comes in direct contact with corrosive media. Some factors which affect the severity of chemical corrosion include: chemical concentration level, duration of contact, frequency of washing and operating temperature.

Electrochemical corrosion:

When two dissimilar metals are in contact and become damp it is possible for corrosion to be induced in one of the metals. Such corrosion may progress rapidly and cause considerable damage so it is important to consider and, if necessary, take steps to eliminate this process.

Galvanic corrosion:

Galvanic Corrosion occurs when two or more dissimilar metals are in contacts in the presence of an electrolyte (ie. Moisture). An electrolyte cell is created and the metals form an anode or a cathode depending on their relative position on the Galvanic Series Table. The anodic material will be the one to corrode. Whether a material is anodic depends on the relative position of the material. For example: If zinc and steel are in contact, the zinc acts as the anode and will corrode; the steel acts as the cathode, and will be protected. If steel and copper are in contact, the steel is now the anode and will corrode.

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The table below shows various corrosion classes. As a guide, we have included the surface treatment recommended by Metaksan for the different classes. On the next pages, we briefly outline the various surface treatments and materials.
As regards environmental corrosion, a steel design component can usually be assigned to one of the corrosion classes (C1-C5-M) as shown in table below.
In this table you can see also the average level of corrosion in zinc. The corrosion classes comply with those stipulated in EN ISO 12944-2.

Corrosion Class	Environmental Corrosion	Mass loss of zinc per 1 year of exposure (µm)	Typical Environment		Recommended min. Surface treatment
			Outdoors	Indoors	Metaksan
C1	Very low	≤ 0.1	-	Heated Buildings, like offices, shops, schools and hotels.	Electro-galvanised or Pre-galvanised according with EN 10142
C2	Low	>0.1 to 0.7	Atmospheres with low levels of airborne pollution Rural areas.	Non-heated areas with formation of condensate like sport halls and warehouses.	Pre-galvanised according with EN 10142
C3	Average	>0.7 to 2.1	Atmospheres containing some salt or average levels of airborne pollution. Urban and light industrial areas. Areas effected by coastal conditions.	Areas with average levels of humidity and some airborne pollution resulting from production processes, like dairies, breweries and laundries.	Hot dip galvanised after manufacture in accordance with EN ISO 1461
C4	High	>2.1 to 4.2	Atmospheres with average salt content or discernible levels of airborn pollution Industrial and coastal areas.	Areas of high humidity and considerable airborne pollution experiance as the result of production processes like chemical plants, swimming pools and dockyards	Hot dip galvanised after manufacture in accordance with EN ISO 1461
C5-I	Very high (industrial)	>4.2 to 8.4	Industrial areas with high levels of humidity and aggressive atmospheres.	Areas with almost permanent condensation and large quantities of airborne pollution.	Stainless Steel AISI 304
C5-M	Very high (marine)	>4.2 to 8.4	Coastal and offshore areas with high salt content	Areas with almost permanent condensation and large quantities of airborne pollution.	Stainless Steel AISI 316

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Hot Dip Galvanised (HDG)

Hot-dip Galvanising is a coating method performed by dipping iron and steel products suitable for galvanising into a molten zinc bath at 450 oC, whereby diffusion of iron (Fe) and zinc (Zn) atoms is occured. In the galvanisation process, zinc and iron in steel body react with each other, forming a zinc – iron alloy on the material surface. When galvanised material is removed from the bath, the upper layer formed on the material surface has a similar composition with the galvanising bath. Dipping periods of steel materials for galvanising depends on the item weight and wall thickness.

In order that the mentioned iron-zinc reaction can be started, the material should be kept inside the molten zinc bath until the temperature of dipped material reaches to the temperature of the bath. When materials placed inside the zinc bath are coated, a thin layer occurs on the zinc bath surface which is caused by the cleaning chemicals and oxidation. These wastes should be removed from the bath surface before taking the coated material out of the bath.

In hot-dip galvanizing method, all the surfaces of the material, which is dipped to the molten zinc, even to the most critical points (sharp edges, cut corners, holes) are coated completely with zinc.

This form of galvanization affords very good value-for-money anti-corrosion protection in atmospheres with a pH value of between 6 and 13. However, in acidic environments where pH levels fall below 6 and in alkaline environments where the pH value exceeds 13, the protective zinc layer breaks down relatively quickly.

The zinc coating, that has a bright view at the first times, will later ha ve a protective layer with a dull gray color.

The minimum coating thickness on the surfaces is 45µm (325gr/m2) and the average coating thickness on the surfaces is about 55µm (395gr/m2) in accordance with EN ISO 1461 quality standard.

Usage life of hot-dip galvanised cable trays & support units is predictable in any environments and it can keep its protective feature even in the heaviest atmospheric conditions. It can last at least 10-20 years in the heaviest industrial mediums and in regions close to seaside, and longer than 25 years in less harmful environments, without requiring any repair maintenance service. In situations where a maintenance is actually required, galvanising is very simple compared with the repair required by other protection methods.

Pre-galvanised (PG)

This galvanization method is the one which is practiced before there is any fabrication done over the material. While this is also a method of hot-dip galvanizing, it differs in the thickness of coating and its order in the flowchart of the process. At the very simplest sense, after the coil of steel is flattened, it enters into an ammonium chloride (flux) mixture bath and then enters into the molten zinc bath continuously. After the zinc coating is smoothened it is then re-coiled and the manufacturing company uses this as a raw material for itself.

This homogeneous coating thickness on the surfaces has a changing value from 10µm to 20µm (70gr/m2 140gr/m2) in accordance with EN 10346.

Cable trays & support elements manufactured from a steel with such characteristics is recommended to be used inside buildings where dry air is present and lacking harming products and their related effects which may result in corrosion. Consequently, choosing cable trays made out of pre-galvanized steel where suitable conditions are available instead of hot-dip galvanized cable trays provides an economical advantage.

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Material plated by pre-galvanizing method will be protected against corrosion on cut surfaces due to cathodic effect between zinc and iron elements. (It is valid and effective up to 2mm thickness).

MADE IN TURKEY

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Stainless steel

Metaksan stainless steel products, manufactured in accordance with SS 2333 AISI 304, or in accordance with SS 2348 AISI 316L are designed for use in highly aggressive environments, either indoors or outdoors, on industrial sites where there are high levels of potent airborne pollution such as in certain chemical industries, celluloserelated industries, refineries or artificial fertiliser factories, high humidity tunnels, etc.

Stainless steel products are also ideal for use in environments where special hygiene requirements are in force, such as dairies, abattoirs, other food industries and pharmaceuticals factories.

Stainless steel AISI 304 or AISI 316L

The deciding factor in choosing between stainless steel AISI 304 or AISI 316L is the aggressiveness of the environment in which it is to be used, and for this atmospheric chlorine content plays a significant role. Environments with a high chlorine content - coastal areas being a prime example - are aggressive and usually require the use of AISI 316L materials.
When assessing the needs of factories, consideration should be given to the materials previously used to suspend equipment such as pipe tubing, and from this determine whether stainless steel AISI 304 or AISI 316L material is required.

Rate of dissolution

The rate of dissolution is determined by the pH value of pure zinc in distilled oxygenated water that has been pH adjusted to various levels using HCl or NaOH. NB The curve only applies to conditions shown, and gives only an indication of the propensity for corrosion without consideration.

Passivation

Passivation of the stainless steel will occur naturally after pickling when the oxygen in the air will react with the surface of the steel to form a passive chromium oxide layer. However it is usual for this passivation process to be speeded up by immersing the article in a nitric acid or other passivating agent.

Electropolishing

In various industries such as food, pharmaceutical and electronics, there is a requirement for easier cleaning and reduced bacterial growth on the surface of the stainless steel.

This increased surface smoothness is achieved by a process called electropolishing.

Electropolishing is, in principle, a reversal of the electroplating process. The article is submerged in a special acid electrolyte and a DC current passed into the article and through the electrolyte. This process removes the high spots from the surface micro roughness leaving a surface which is bright and smooth.

Epoxy

Powder coated finishes give excellent protection against scratches as they are normally between 50 - 100% harder than the equivalent wet paint finishes. They are available in a wide range of colours and can have matt or various gloss finishes. In addition to the aesthetic qualities powder coating are available in various grades to cope with different site conditions. Grades are produced to cope with exterior applications where there can be high levels of ultra violet light or low smoke and fume applications for fire risk areas such as occur in tunnels. Because powder coated finishes are inherently resilient and resistant to chemical or corrosive attack, these finishes are frequently used for protection only where there is no aesthetic requirement.

Electro-Galvanizing

Electrolytically, a zinc coating is deposited on the steel. The baths used cosist of acid or alkali solutions of zinc salts. The anodes are zinc and the parts to be coated, previously degreased and cleaned, are connected to the cathode. The minimum coating thickness by this method is 8µm. Such products are intended for use only in warm, dry areas with negligible pollutant levels.