Hot-Dip Galvanized Reinforcing Bars

Reinforcing steel (rebar) is widely used in a variety of applications from bridges to reinforced buildings to enhance the tensile strength of the surrounding concrete. However, the addition of these strengthening elements can prove problematic for the structure if proper care is not taken to avoid corrosion. Because of the porous nature of concrete, corrosive elements such as water, chloride ions, oxygen, carbon dioxide, and other gases travel into the concrete matrix, eventually reaching the steel reinforcing bar. As the concentration of these corrosive elements increases, particularly chlorides, steel's corrosion threshold is eventually exceeded and starts to corrode. When steel rebar corrodes, its corrosion products are 2-10 times more voluminous than the original steel. This increase in volume around the steel rebar exerts great disruptive tensile stress on the surrounding concrete. As pressure builds, the concrete will begin to crack, creating a direct pathway for the corrosive elements, leading to accelerated rebar corrosion and eventual spalling of the concrete (American Galvanizers Association, 2023).

Corrosion of reinforcing bars is recognized as the leading cause of concrete deterioration in civil infrastructure. Such damages cause heavy losses both socially and economically. It has been estimated that the annual cost of the deterioration of reinforced concrete structures corresponds to 2-4% GDP/annum worldwide (H.Guo, Y.Dong, X.Gu, Feb. 2020). Thus, the corrosion effect and its adverse influences on structural durability should be paid special attention to, and it is of great importance to establish a comprehensive framework to assess the durability of reinforced concrete structures.

There is, however, a way to protect these infrastructure investments from the ravages of corrosion. Galvanizing is very effective in combating the effects of carbonization-induced reinforcement corrosion and increases resistance to chloride corrosion both by increasing the threshold chloride level where corrosion begins and also by slowing the rate of corrosion after that threshold is exceeded. The field test results confirm that reinforced concrete structures exposed to aggressive environments have a substantially longer service life when galvanized rebar is used as opposed to bare steel rebar. In Europe, galvanized reinforcement has been mainly used in particularly aggressive environments so far, such as coastal applications, sewer systems, road tunnels etc. and to construct tailor-made products for specific projects (European General Galvanizers Association, July 2021).

General features and advantages of galvanized reinforcing steels (rebar) are given below;

1. Typically, galvanized reinforcing steel increases the service life of the structure by 4 to 5 times when compared to uncoated reinforcing steel.

2. The minimum zinc coating thickness on galvanized reinforcing steel bars is 610 gr/m^2 i.e. 85 µm. Appearance free from uncoated areas, blisters, flux deposits and gross dross inclusions as well as having no heavy zinc deposits that interfere with intended use.

3. It is not affected by UV lights during the storage period at the construction site.

4. The galvanized bars be immersed in a heated, sodium dichromate solution immediately after the process. This post-treatment helps to prevent the formation of wet storage stain on the bars when they are in bundles at a job site and also promotes good adhesion of the galvanized rebar to the concrete it is placed in.

5. When galvanized rebar is subjected to various processes such as bending or bending, cracking and flaking of the galvanized coating layer in the bending areas is not a reason for rejection. Because the damaged layer is the pure zinc layer on the outermost surface. The undamaged Zn-Fe alloy layers of the coating will provide corrosion protection for many years. However, if desired, these areas can be repaired by an acceptable method.

6. Application areas of galvanized steel reinforcement; bridge decks, beams and columns exposed to the external surface, high towers and skyscrapers, coastal and marine structures and airports.

7. Related Quality Standarts; ASTM A 767, EN 10348-2, ISO 14657.

Today, "Batch Hot Dip Galvanizing" and "Zinc Spraying Metallization" are two widely used methods for zinc coating of rebars. However, both methods have some disadvantages. The low production tonnage in batch galvanizing causes operating costs to increase. In this method, after the steel reinforcement is installed on the construction site in accordance with the project, it is sent to the facility where it will be galvanized. It is obvious that this situation will lead to increased transportation cost. In zinc spray metallization process, there is no metallurgical bond between the base metal and the zinc coating layer. For this reason, the corrosion protection of galvanize coating is quite insufficient in this method.

New Generation Rebar Galvanizing Lines

Unlike the methods mentioned above, KFS METAL successfully produces "Continuous Hot Dip Galvanizing Plants" that enable high production output and high zinc coating quality. With this newly developed facility by KFS METAL, rebars of the desired length and diameter will now arrive at the construction site as ready-made galvanized. In this way, additional transportation costs and loss of time will be prevented as much as possible. Operating costs will be quite low due to the high efficiency of this facility, which is designed for mass production. Additionally, due to the ease of use and processing of reinforcing bars, significant savings will be achieved during building construction. The technical specifications of our turnkey facility are given below;

Working Style: Continuous Flow, Full Automatically
Quality Standards: ASTM A 767, EN 10348-2, ISO 14657
Metric Bar Size: 8,0 - 50,0 European Rebar Size Chart
Material Length: 4,0 - 12,0 m
Zinc Coating Thickness: min. 85 µm or 610 gr/m^2
Type of Fuel: 8500 kcal/Nm^3, Natural gas or LPG
Production Capacity: 4,0 - 5,0 tons per hour

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