



CORROSION PROTECTION FOR LIFE

Residential homes are one of the few necessities that consumers expect to last a lifetime or more. It is critical therefore, that a home's framing material perform its function for as long as other critical components such as the roof structure, exterior and interior wall coverings, and flooring. To last a lifetime, cold-formed steel framing needs proper corrosion protection.

Galvanizing has proven to be the most economical and effective way to protect steel. All steel framing materials used in residential construction can be effectively protected by a galvanized coating.

Galvanizing

Galvanizing is a process whereby steel is immersed into a bath of molten zinc (850°F/450°C) to form a metallurgically bonded zinc coating. This same hot dip immersion process is also used to produce zinc-aluminum alloy coatings. Most cold-formed steel is galvanized by unwinding coils of cold rolled steel and feeding the sheet continuously through a molten zinc bath at speeds up to 600 feet per minute (200 metres/minute). As the steel exits the molten zinc bath, air "knives" blow off the excess coating from the steel sheet and control the coating thickness to the specification requirement. The coated sheet steel is passivated, oiled and recoiled for shipment to the fabricator.

Corrosion Process

Freshly exposed galvanized steel reacts with the surrounding atmosphere to form a series of zinc corrosion products. In air, newly exposed zinc reacts with oxygen to form a very thin zinc oxide layer. When moisture is present, zinc reacts with water resulting in the formation of zinc hydroxide. A final common corrosion product to form in atmosphere is zinc carbonate as zinc hydroxide reacts with carbon dioxide in the air. Zinc carbonate is usually a thin, tenacious and stable (insoluble in water) layer that provides protection to the underlying zinc. These corrosion products are what give zinc its low corrosion rate in most environments.

How Zinc Protects Steel

Galvanized coatings protect steel by providing an impervious barrier that does not allow moisture to contact the steel - without moisture (the electrolyte) there is no corrosion. The nature of the galvanizing process ensures that the metallic zinc coating has excellent coating adhesion and abrasion resistance.

scratch in the coating exposes underlying steel

Galvanized Steel

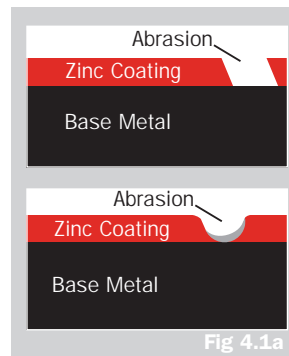


Fig 4.1a

Surrounding zinc coating cathodically protects the exposed steel.

Painted Steel

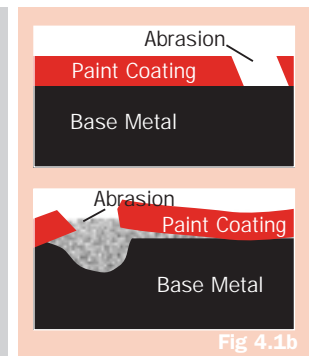


Fig 4.1b

Exposed steel corrodes further damaging the surrounding paint film

Cathodic Protection

When base steel is exposed, such as at a cut or scratch, the steel is cathodically protected by the sacrificial corrosion of the zinc coating adjacent to the steel. This occurs because zinc is more electronegative (more reactive) than steel in the galvanic series. In practice, this means that a zinc coating will not be undercut by rusting steel (Figure 1) because the steel cannot corrode adjacent to the zinc coating.

Durability of Steel Framing

Just as water leakage, excessive humidity or condensation will damage any construction material over time, so will it accelerate the corrosion of zinc coated materials. In residential and most categories of low-rise commercial properties, the corrosion rate of zinc coated materials is generally very low. Interior, non load-bearing walls will likely experience the most benign atmosphere, while vapor barriers and thermal breaks in exterior walls should eliminate exposure to any significant moisture. For joists and track that are attached directly to concrete or exterior walls, precautions should be taken so that the environment remains dry. Special care should be given the use of any steel studs or joists that are exposed to extended periods of high humidity or aggressive industrial or marine environments.

