



United States Steel

Technical Bulletin Construction:
Hot-Dip Galvanized (HDG) Sheet Steel

For further assistance on the use of steel building panels or related topics, contact U. S. Steel Construction Sales

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Product Description

Hot-dip galvanized (HDG) is the common name for a type of sheet steel product that is coated with zinc using a continuous hot-dip coating process. The coating combines the formability and corrosion protection of zinc with the cost effectiveness of steel.

HDG, bare and painted, is intended for uses where superior corrosion resistance is required. Typical applications are roofs, framing, grain bins and siding. The zinc coating provides a barrier and will galvanically protect the steel.

In certain environments, United States Steel Corporation (U. S. Steel) recommends not using HDG or recommends using additional precautions to limit corrosion. These environments include:

- Contact with lead or copper, including but not limited to, treated lumber that contains copper.
- Harshly corrosive environments, including close proximity to seawater, areas with excessive water exposure or chronic exposure to corrosive chemicals.



Beauty and flexible design for residential roofing

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Material Description

Common ASTM designations for the construction industry are Commercial Steel (CS) types A and B, Forming Steel (FS), and Structural Steel (SS) Grades 33, 37, 40, 50, and 80. U. S. Steel also offers customized grades upon request, contact the U. S. Steel Construction Sales Group. See Technical Bulletin “ASTM Designations for Steel Properties of HDG and GALVALUME®¹ Sheet Steel” for further information. HDG sheet steel may be temper rolled (extra smooth) and/or tension leveled to improve its shape and surface.

U. S. Steel hot-dip galvanized steel is composed of 99% zinc with small additions of aluminum to improve adhesion and control appearance. Small amounts of antimony may optionally be added. U. S. Steel recommends a chemical passivation treatment for bare and some painted applications. U. S. Steel produces HDG in conformance with ASTM A563. The minimum ASTM coating weights are shown in Table 1.

Table 1. HDG Coating Weight

| ASTM A 653 Coating Designation | Minimum Coating Weight (oz/ft ²) | | |
|--------------------------------------|--|---------------------|------------------|
| | Triple Spot Test | | Single Spot Test |
| | Average Total Both Sides | Average One Side | Total Both Sides |
| G210 | 2.10 | 0.72 | 1.80 |
| G185 | 1.85 | 0.64 | 1.60 |
| G165 | 1.65 | 0.56 | 1.40 |
| G140 | 1.40 | 0.48 | 1.20 |
| G115 | 1.15 | 0.40 | 1.00 |
| G90 | 0.90 | 0.32 | 0.80 |
| G60 | 0.60 | 0.20 | 0.50 |
| G40 | 0.40 | 0.12 | 0.30 |
| G30 | 0.30 | 0.10 | 0.25 |

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Corrosion Protection

HDG sheet steel protects well against corrosion. Figure 1 shows typical results of outdoor exposure testing on G90 HDG coated steel sheet. The length of time to red rust is proportional to the thickness of the zinc coating. For heavy gauge steel, thicker HDG coatings are available that can provide the proportionally longer usable lifetimes that many applications require.

Painting HDG will significantly increase the usable life of the product through improved barrier protection. This is a popular option and U. S. Steel has a very active program to help customers obtain the best performance with prepainted HDG. Each prepainted coil must pass on-line product quality tests of paint thickness, cure, adhesion, color and gloss.

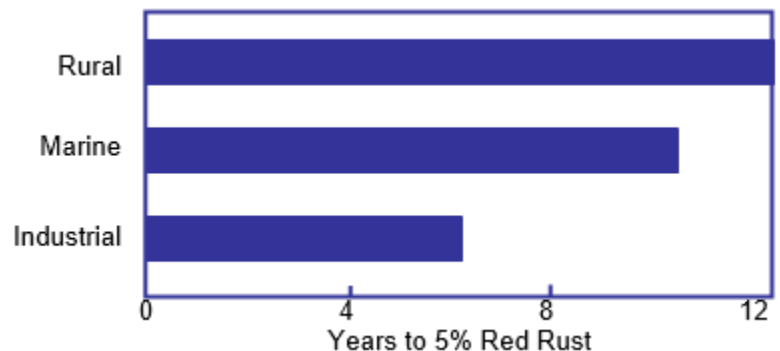


Figure 1. Outdoor exposure results for bare G90 hot-dip galvanized steel

The corrosion resistance of prepainted HDG is excellent. Figure 2 shows the average edge corrosion from the average exposure results of a marine site, a non-marine subtropical site, an industrial site, and an acid rain site. Initial edge corrosion is slight and increases only slowly for the first years.

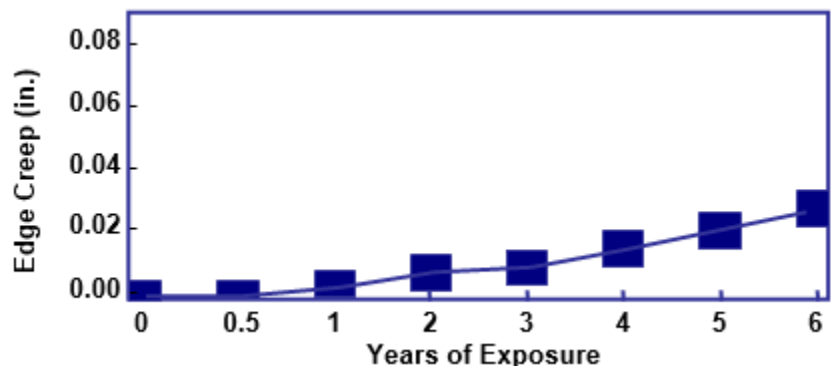


Figure 2. Outdoor exposure results for prepainted hot-dip galvanized steel

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Other Hot-Dip Galvanized Properties and Services

Technical Support

U. S. Steel has technical service and regional sales representatives located throughout the United States. For technical support, contact your technical service or sales representative. Technical literature is available through either your local representative or on our website.

Formability

HDG sheet is easily brake-formed, roll-formed or stamped. If desired, vanishing oil may be mill applied to assist in roll-forming unpainted product. Prepainted HDG can be roll-formed without additional lubricants. Formability assistance is available through the U. S. Steel Construction Sales Group.

Handling

Bare HDG is subject to storage stain if exposed to moisture in coil form or in a tight stack of formed panels. To help minimize the potential for storage stain, U. S. Steel applies a chemical treatment to HDG for use in unpainted applications, unless otherwise requested.

Structural Applications

HDG sheet steel is available in heavier steel gauges and with thicker coatings for structural parts requiring a combination of high strength and excellent corrosion protection.

Warranty

U. S. Steel passes the paint company's warranty to the customer and helps with any warranty questions when prepainted HDG is purchased directly from U. S. Steel. Otherwise, the paint company must be contacted concerning warranty questions.

Quality Control

U. S. Steel HDG must pass coating adhesion, steel hardness, coating weight, and surface appearance tests before shipping, ensuring customers receive the highest quality product. Additionally, tensile tests are performed on some products before shipping.

Installation

HDG is readily installed in the same manner as other steel products. Choose fasteners that have a life expectancy equivalent to HDG. Sealants should be only of the neutral cure type.