

ArcelorMittal Dofasco



ArcelorMittal

# Galvanize and Galvanneal Steel



# Multiple Applications & Long Lasting Corrosion Protection

ArcelorMittal offers a variety of Galvanized Steel Sheet Products which are zinc coated steel products with long lasting corrosion performance and paintability for a diverse range of construction applications and environments. The galvanic and barrier protection of the zinc coating protects the base steel and any cut edges from corrosion and provides a good surface for paint for additional barrier protection and esthetics. The galvanized products offered by ArcelorMittal include Hot Dip Galvanize (most commonly used) which can be produced with a wide range of light to heavy zinc coatings, and Hot Dip Galvanneal which consists of light hot dipped zinc coatings which are heat treated/annealed after coating to produce a zinc-iron alloy for improved weldability and paintability.

## Product Description

Hot Dip Galvanize (HDG or GI) is produced at numerous ArcelorMittal galvanizing facilities in Canada and the USA on continuous lines by passing pre-heated continuous strip through a bath of molten zinc. The required zinc coating thickness for different coating specifications is achieved as the result of passing the hot dipped strip through a variable low pressure, high volume air stream called an "air knife" prior to solidification of the zinc coating. In addition, based on the application, the zinc coating can be produced with minimized (no) spangle, be a light to heavy zinc coating (for additional corrosion protection), and can be inline or post temper rolled if a smoother surface is required.

Galvanneal (GA) is produced at ArcelorMittal galvanizing facilities in Canada and the USA on continuous lines by passing pre-heated continuous strip through a bath of molten zinc. In this case after zinc coating, the strip is passed through an annealing furnace which produces a zinc-iron alloy coating on the steel surface.

As with HDG, the required zinc coating thickness for different coating specifications is achieved by passing the hot dipped strip through an "air knife" just before the galvannealing furnace. The zinc-iron alloy coating has no spangle, has a uniform grey matte appearance, and the coating weights are typically less than most HDG products. This material can also be temper rolled after coating for an extra smooth surface for surface critical applications.



| Products           | Grades  | Gauge (in)       |                  | Width (in)    | Coating Weights   |
|--------------------|---|------------------|------------------|---------------|---|
|                    |   |                  |                  |               |   |
| Hot Dip Galvanized | CS, DDS, EDDS, FS, SS (Grade 33 to Grade 80), HSLA (Grade 40 to Grade 80)     | 0.009" (0.23 mm) | 0.165" (4.19 mm) | 72" (1829 mm) | G30, G40, G60, G90, G115, G140, G165, G200, G235 (Z90, Z120, Z180, Z275, Z350, Z450, Z610, Z720)    |
| Galvanneal         | CS, DS, DDS, EDDS, FS, SS (Grade 33 to Grade 80), HSLA (Grade 40 to Grade 80) | 0.009" (0.23 mm) | 0.165" (4.19 mm) | 72" (1829 mm) | A25, A30, A40, A60 (ZF75, ZF90, ZF120, ZF180)   |
| Prepaint           | HDG   | 0.009" (0.23 mm) | 0.060" (1.52 mm) | 61" (1549 mm) | Paint Systems: Acrylic, Polyester, Silicon Modified Polyester (SMP), Fluoropolymer (PVDF), Plastics |

### Notes:

- Gauge, width, and available coating weights are overall capabilities and vary by production line. Please inquire with exceptions.
- Pre-painted products at wider widths/heavier gauges may be available depending on coil coater used.
- On bare heavier gauge galvanize applications with cut edges, heavier galvanize coatings (>G90) should be used to ensure galvanic protection of the cut edge.

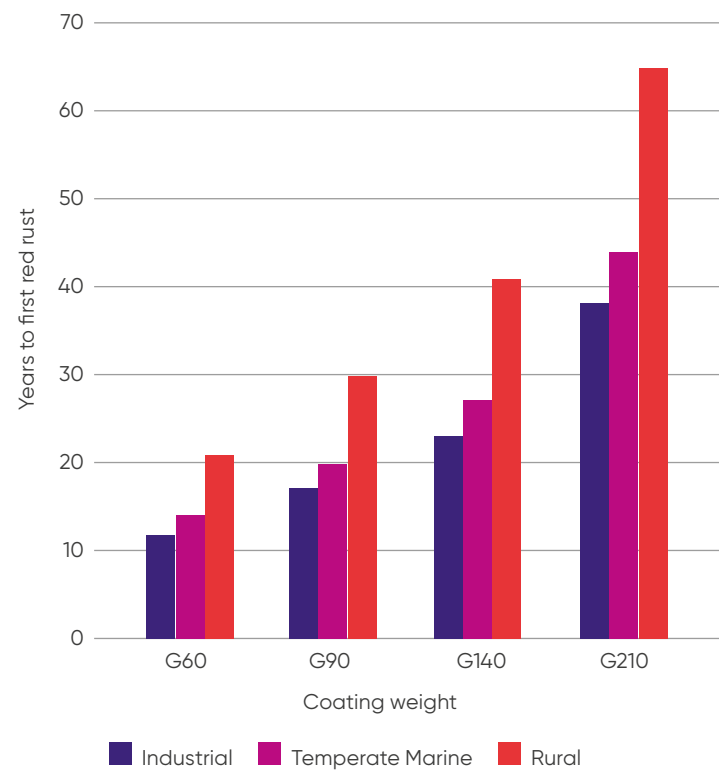
The zinc coating provides galvanic sacrificial cut edge protection to prevent corrosion (rusting) on exposed edges.



**Product Characteristics**

**Proven Corrosion Resistance**

For similar unpainted galvanize applications, service life is extended with heavier zinc coating weights but adversely affected by aggressive environments such as industrial or marine settings. In addition, painting of galvanize products provides additional barrier protection, extended product life, and aesthetics.



The zinc coating provides galvanic sacrificial cut edge protection to prevent corrosion (rusting) on exposed edges. For these applications, as steel thickness is increased, heavier galvanize coating should be used to ensure sufficient galvanic edge protection for the increased cut edge surface area.

**Enhanced Surface Treatment**

ArcelorMittal offers a variety of surface treatments suited to specific manufacturing and application needs. Unpainted Galvanize can be chemically treated with a RoHS compliant passivation system produced dry or oiled, or with an acrylic coating. See ArcelorMittal LustreLok™ for more information on acrylic coated galvanized steel and product offering. If paint is specified, galvanize steel can be ordered as prepainted coil. This option offers an additional layer of paint protection/barrier performance in a wide assortment of attractive colors and paint systems.

**Applications**

Hot Dip Galvanize, and Galvanneal have many proven applications in Commercial, Industrial, Institutional, Agricultural, and Residential Construction. Example applications for each product are shown below (but not limited to):

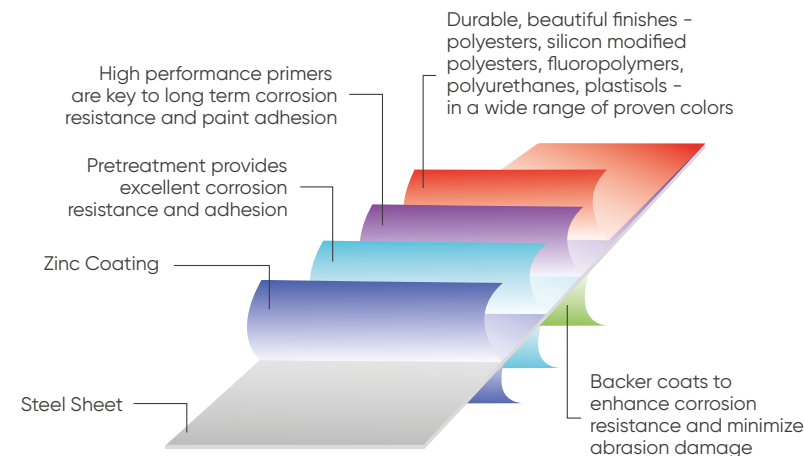
- Hot Dip Galvanize (bare/pre-painted) for roofing, cladding (siding), ceiling grid systems, light steel framing, garage doors, major appliances, HVAC, electrical boxes, pools, building components, solar framing, culverts, grain bins, truss plates, water heaters, & many other applications.
- Galvanneal (bare) for floor decking, commercial doors, & corner beads

**Prepainted Galvanize**

Galvanized sheet steel can also be ordered as a prepainted coil. Prepainted Galvanize provides additional paint barrier protection while offering a wide assortment of attractive colors and paint systems to fit many unique needs and applications, and can offer improved properties in:

- Corrosion resistance
- Solvent, chemical and stain resistance
- Adhesion (for bonding or foaming)
- Mechanical properties: hardness, toughness, and flexibility
- Color and aesthetic properties: appearance (gloss/matte & smooth/texture) and opacity
- Durability
- Energy Efficiency
- Meeting health, safety, and environmental regulations

Depending on paint requirements and exposure, a variety of polyester, silicon modified polyester, and fluoropolymer paint systems are available; and should be specified with assistance from ArcelorMittal. A schematic of a typical paint system and the benefits of each component are shown in the figure to the left.



**Recycling & Sustainability**

**Recycling**

All galvanized and galvanized steel products are virtually 100% recyclable. In North America, typically 60 to 80 million tons/year of steel scrap is recycled/reused in the production of new steel products. By using steel scrap to make new steel, the steel industry conserves energy, emissions, raw materials, and natural resources.

**Sustainability**

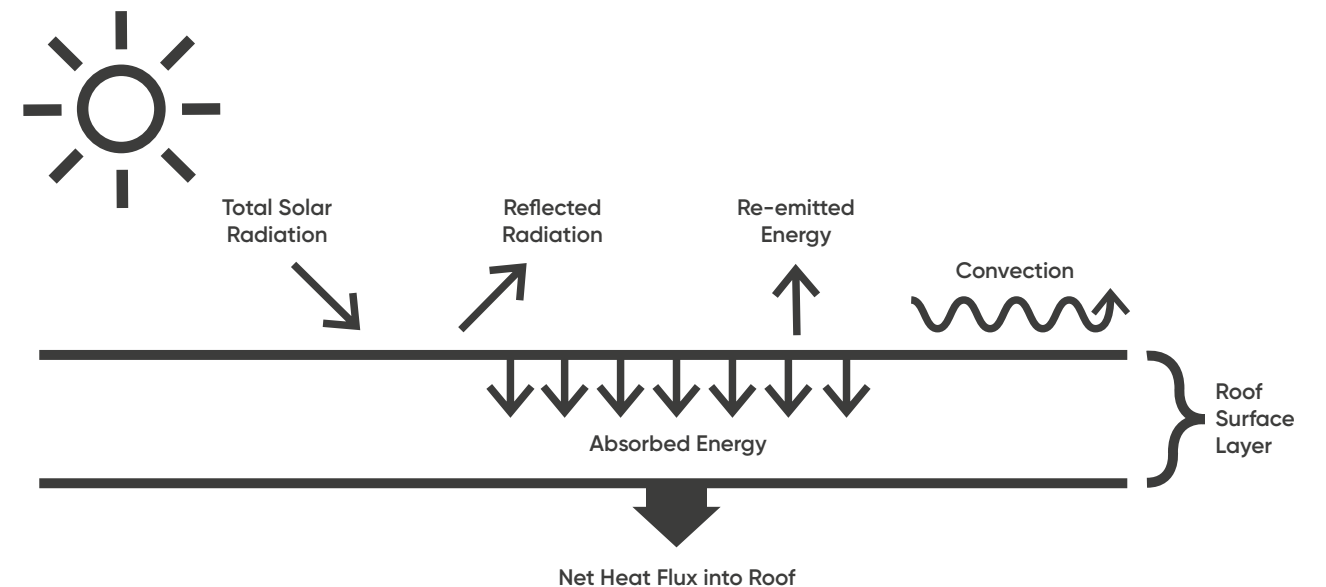
With its high recycled content and end-of-life recovery rate, steel has long been recognized for its strength, durability, functionality, and sustainability. ArcelorMittal is a member of the American Iron & Steel Institute (AISI) and in conjunction with AISI's other member companies have developed comprehensive industrial average Environmental Product Declarations (EPD's) for products available as building materials. These EPDs can be found at [www.buildusingsteel.org/EPDs](http://www.buildusingsteel.org/EPDs).

**Energy Efficiency**

Solar Reflectance (SR) or Reflectivity is the ability of a material to reflect solar energy from its surface back into the atmosphere. The SR "value" is a number from 0 (100% absorbance) to 1.0 (100% reflectance). For construction roofing products, a higher value indicates less energy absorption and lower roof surface temperature and subsequent heat transfer into a building.

The US Environmental Protection Agency (EPA) & Department of Energy (DOE) – ENERGY STAR™ Program requires an initial SR value of 0.25 or higher for steep slope (more than 2:12) roofs and 0.15 or higher after 3 years, or an initial SR value of 0.65 or higher for low slope (2:12 or less) roofs and 0.50 or higher after 3 years. The use of select prepainted systems (typically lighter colors) on Galvanized "cool roofing" products can meet or exceed these ENERGY STAR requirements resulting in significant savings in a building's air conditioning requirements. In addition, higher SR values are also now achievable on select dark color paint systems which allow architects more color choices while still achieving energy savings (though these systems may not qualify for the Energy Star Rating).

The Solar Reflectance Index (SRI) is used to determine compliance with Leadership in Energy & Environmental Design (LEED™) requirements for reduced heat island effect and is calculated using values for reflectance and emissivity (a material's ability to release absorbed energy). To meet LEED requirements, a roofing material must have an initial SRI value of 39 or higher and at least 32 after 3 years for steep slope (more than 2:12) roofing, or an initial SRI value of 82 or higher and at least 64 after three years for low slope (2:12 or less) roofing. These performance requirements can also be met with the use of select prepainted systems on Galvanized products.



### Points to Remember

#### Compatibility with Dissimilar Metals & Environmental Effects

For Galvanize coated steels, contact with lead or copper must be avoided (including products containing lead or copper such as pressure treated lumber) as it can result in accelerated corrosion.

In addition, Galvanize coated steels are not recommended (or require additional zinc coatings and/or paint to limit corrosion) for applications near seawater (chlorides accelerate corrosion) or other harsh corrosive environments which have heavy exposure to corrosive chemicals (such as caustic soda, ammonia, lime, hydrochloric acid, nitric acid, hydrogen sulfide, sulfuric acid, sulfur dioxide), or excessive water exposure/contact with wet materials or standing water.

For all outdoor, bare HDG applications a minimum G90 (Z275) or heavier is recommended and for additional protection in corrosive/polluted environments, prepainted galvanized products should be considered.

Galvanize and Galvalume™ steel can be combined on the same building elevation, although it is not advisable because unpainted Galvanized will likely exhibit corrosion before Galvalume. As a design practice, when both materials are in contact, always use Galvalume steel downstream from unpainted Galvanized steel, otherwise accelerated corrosion of the Galvanized steel can occur. However, Galvalume steel can be used for the roof and Galvanized steel for the sides of a building.

#### Handling and Storage

To preserve the surface, handling should only be carried out using clean, dry gloves. Do not slide sheets over rough surfaces or each other.

As with painted steel products or Galvalume, bundles of Galvanize steel sheets or products made from Galvanize steel in all finishes must be kept dry in transit. After transit, material should then be covered and stored off the ground, at a slight angle, to prevent water or condensation from being trapped between adjacent sheet surfaces.

If the bundles become wet, sheets should be separated, wiped with a clean cloth without delay and then placed so that air circulation completes the drying process. These procedures are recommended to avoid possible deterioration of the coating, which could result in non-uniform appearance.

#### Joining and Sealing

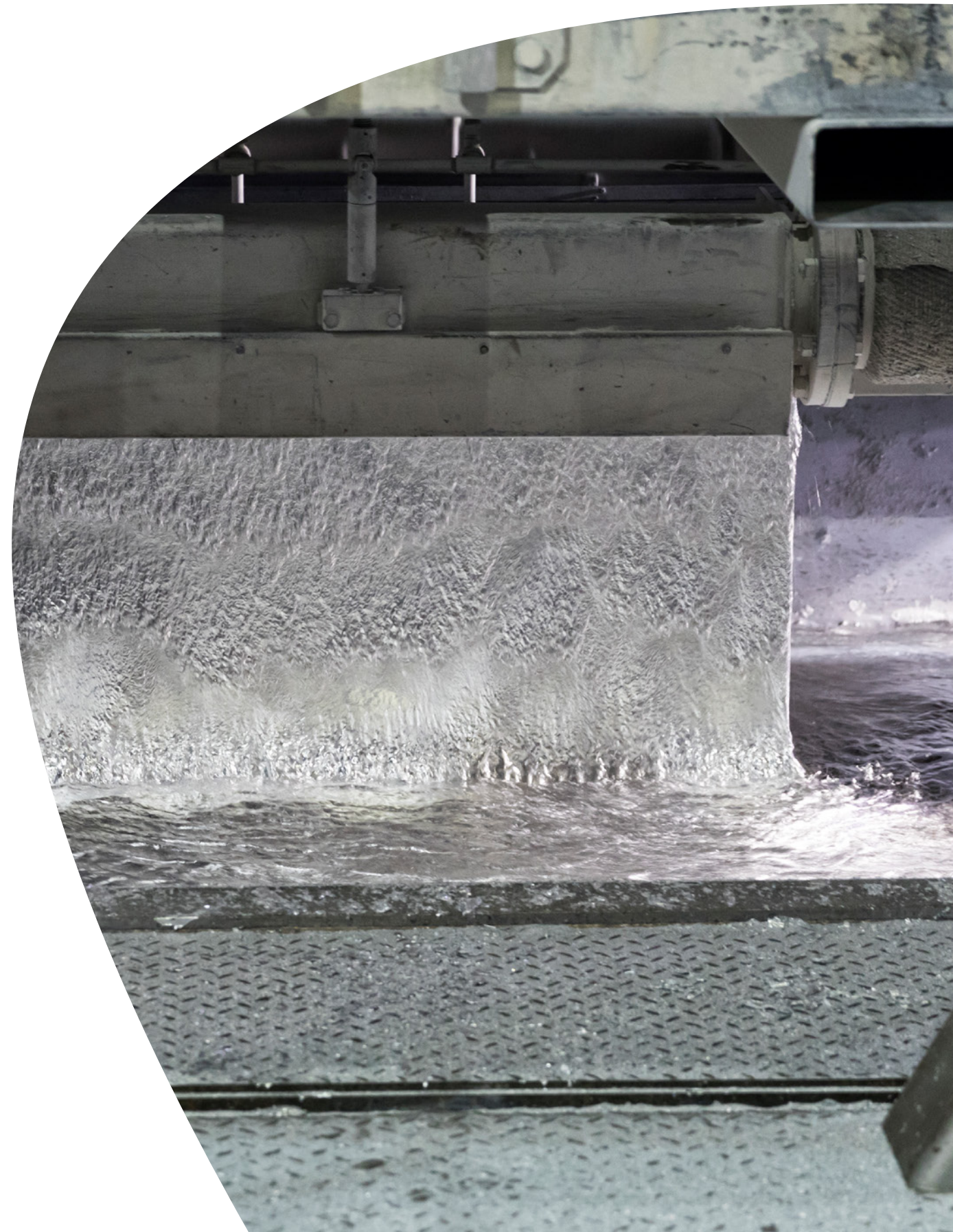
Common fasteners used on galvanize & galvanneal sheet include:

- Mechanical Zinc Plated Fasteners are produced by impacting/adhering zinc to the fastener surface which results in a porous light to heavy zinc coating (as required) that may have a top sealer and provides good galvanic corrosion protection (which improves with zinc coating thickness). However non-uniform zinc may be deposited in the base of the screw threads.
- Electro-Zinc Plated Fasteners are produced by acid cleaning the fastener prior to electroplating zinc, followed by a sealer for addition temporary protection which results in a fastener with good galvanic and barrier protection. They are the most commonly used type of fastener.
- Hot Dip Galvanized Fasteners are produced by immersing the fasteners in a bath of molten zinc which results in thicker continuous zinc coatings with good galvanic and barrier protection. However excessive zinc may be deposited in the base of the screw threads.
- Specialty Coated Fasteners are produced with metallic and polymer coatings typically in a dip, spin, bake operation, and offer improved fastener corrosion performance over just zinc plating. This fastener also typically has a built-in gasket.
- Stainless Steel Fasteners are typically made of 304 or 316 stainless steel which contain ferrous alloys containing chromium and nickel which gives the steel very good corrosion resistance, generally require a non-conductive gasket between the stainless steel fastener and galvanized material, and due to higher cost are typically used in highly corrosive environments.

In addition, washers made of EPDM, or a similar material should be used, fasteners containing lead or copper should be avoided along with lead headed nails and lead washers. The ultimate selection of suitable fasteners to be used rests solely with the Buyer.

For construction projects using pressure treated wood, fasteners should be: hot-dipped galvanized (for limited applications such as connecting strapping to an ACQ pressure treated wood framing member), or stainless steel (300 series recommended), or other fasteners or coatings as recommended by the fastener manufacturer. In addition, non-permeable membrane materials (such as ice/water shield) should be used between galvanize panels, components, etc., in direct contact with pressure treated wood.

For sealing, neutral cure silicone or butyl rubber-based sealants should be used. Sealants containing acetic acid or amines should not be used on galvanized steel. Check with your sealant supplier for brand name recommendations.



## Smarter steels for people and planet

ArcelorMittal is one of the world's largest steel and mining companies. Guided by a philosophy to produce safe, sustainable steel, it is a leading supplier of quality steel products in all major markets including automotive, construction, energy, household appliances and packaging. ArcelorMittal is present in more than 60 countries and has an industrial footprint in more than 20 countries.

With a strong presence in North America, Europe, South America and South Africa, and an emerging presence in China, ArcelorMittal delivers a large scale of products, solutions and services to customers with the same quality focus in all regions. ArcelorMittal is a leader in steel technology, both in the breadth and depth of our product portfolio, and in our ability to supply a range of grades throughout the world. ArcelorMittal is a supplier of choice for all markets, a testament of our commitment to working collaboratively with our customers to engineer advanced steel grades to meet their needs.

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