Fine-Tune Your Knowledge On
The Metallizing Process
1. What is Metallizing?

Metallizing is a common term used to describe thermal sprayed metal coatings. For corrosion protection of steel elements, it refers to the thermal spray of molten zinc or aluminum alloys as a direct coating on steel surfaces. This is accomplished by feeding the metal in either wire or powder form to an application gun where it is melted and propelled onto the steel surface to be protected. Upon contact, the zinc “splats” cool instantly, creating a solid barrier that isolates the steel substrate from the environment.
2. How Does a Metallized Coating Protect the Steel Substrate?

Metallizing protects steel in two ways:

1- **Barrier Protection:**
The spray coating itself provides a strong barrier between the environment and the steel surface, keeping out water that eventually leads to oxidation.

2- **Cathodic Protection:**
Metallizing is also effective because it relies on an electrochemical reaction between steel and zinc to drive these zinc-based coatings to "sacrifice" themselves to protect the steel at the site of any damage. This sacrificial protection is akin to the protection provided by zinc-rich primers or galvanizing.
3. What is the Difference Between Metallizing and Hot-Dip Galvanizing?

Metallizing and hot-dip galvanizing are two zinc-based coatings that protect the steel substrate by physical barrier and cathodic protection. However, these two coatings are significantly different.

Metallizing relies on a mechanical bond between the zinc and the surface of the steel substrate to form a protective coating. Because of this mechanical bond, the surface preparation is critical to performance.

Hot-dip galvanizing is a total immersion process where the steel element is dipped into a bath of molten zinc. Unlike metallizing, galvanizing metallurgically bonds the zinc to the steel substrate making it a part of the steel, not a coating. The size and shape of a steel member that can be galvanized is determined by the size of the kettle containing the molten zinc. For practical reasons, primary bridge elements such as girders are often metallized and connected to secondary components such as cross frames that can be hot-dip galvanized.
4. What are the Advantages of Metallizing?

• No size limitation which can ultimately reduce the number of field splices needed when compared to galvanized members.

• No dry or cure time, which significantly increases fabricator throughput.

• Zinc is a recyclable material and the metallizing process produces zero volatile organic compound emissions.

• Low temperature process in which the metallized surface never exceeds 250-300°F. Thus, there is virtually no risk of weld damage or distortion of the steel due to high temperature or overheating.
5. How Durable is a Metallized Coating?

Steel structures are subjected to aggressive environmental conditions. Metallizing ensures their longevity and structural integrity. In fact, with proper surface preparation and with a ten-year inspection cycle, a metallized coating can provide an indefinite service life well in excess of 30 years. Moreover, topcoat sealant can be used to fill the voids and prevent moisture infiltration, increasing the durability of the coating.
6. What Surface Preparation is Required for Metallizing?

To ensure a successful long term performance under severe conditions, preparation of SSPC-SP 5, or White Metal Finish with an appropriate angular profile is recommended.

However NACE 12/AWS 2.23M/ SSPC – CS 23.00 specifies a minimum surface preparation of SSPC-SP-10, or near-white-metal finish obtained by blasting.

A minimum of 2.5 mils of a sharp, angular profile depth is required. A high spray velocity is essential to penetrating the anchor profile valleys and developing superior splat adhesion. Particles are locked into the ridges of the profile peaks upon cooling.
7. How Experienced is Canam-Bridges with the Metallizing Technology?

Since 1986, Canam-Bridges has metallized more than 2.5 million square feet of structural steel. That is like metallizing the entire surface area of almost 30 Empire State Building!
8. What is the Application Standard of Metallizing?

In Canada, metallizing procedures must follow the CAN/CSA-G189 (2003) Sprayed metal coatings for atmospheric corrosion protection. Canam-Bridges also follows a worldwide specification for the application of thermal sprayed coatings - Specification for the application of thermal spray coatings NACE 12/AWS 2.23M/ SSPC – CS 23.00. Canam-Bridges uses 99.9 % pure zinc wire manufactured per ASTM B833, which covers zinc and zinc alloy wire used to deposit zinc coatings by metallizing for corrosion protection.
9. Does a Metallized Coating Perform Well in High Strength Bolted Connections?

Recent research have shown that unsealed metallized faying surfaces used in high strength bolted connections provide higher slip resistance than specified values for uncoated blast-cleaned Class B surfaces in North American design standards (Chiza and al. 2013; Ampleman and al. 2015; FHWA 2014). These studies followed the recommended procedure in the Research Council on Structural Connections Specification for Structural Joints Using High-Strength Bolts (RCSC 2014).
View our video at
www.canambridges.com/metallizing
Maxime Ampleman completed his bachelor’s degree in civil engineering at Laval University in April 2014. In partnership with Canam-Bridges, he began pursuing a master’s degree at the same university in May 2014, focusing his research on the characterization of slip resistance in metalized slip-critical connections on steel bridges. Maxim began working at Canam-Bridges in April 2015 while continuing to pursue his master’s degree.

Maxime Ampleman
Junior Engineer

A Laval University graduate with a master’s degree in civil engineering, Éric Lévesque joined Canam Group in 1995 in the capacity of design engineer. He currently holds the position of engineering manager for new products at Canam-Bridges, a division of Canam Group Inc.

Éric is a member of Quebec’s professional engineering association, l’Ordre des ingénieurs du Québec, as well as those of Ontario and New Brunswick. He serves on the Transportation Association of Canada (TAC) Structures Standing Subcommittee and is a member of the CAN/CSA-S6 Subcommittee on Section 13 – Movable Bridges, the CAN/CSA-S6 Subcommittee on Section 10 – Steel Structures as well as an associate member of the CAN/CSA-S16 Committee on the Limit States Design of Steel Structures.

Since 1995, he has taken part in the execution of over 200 major projects.