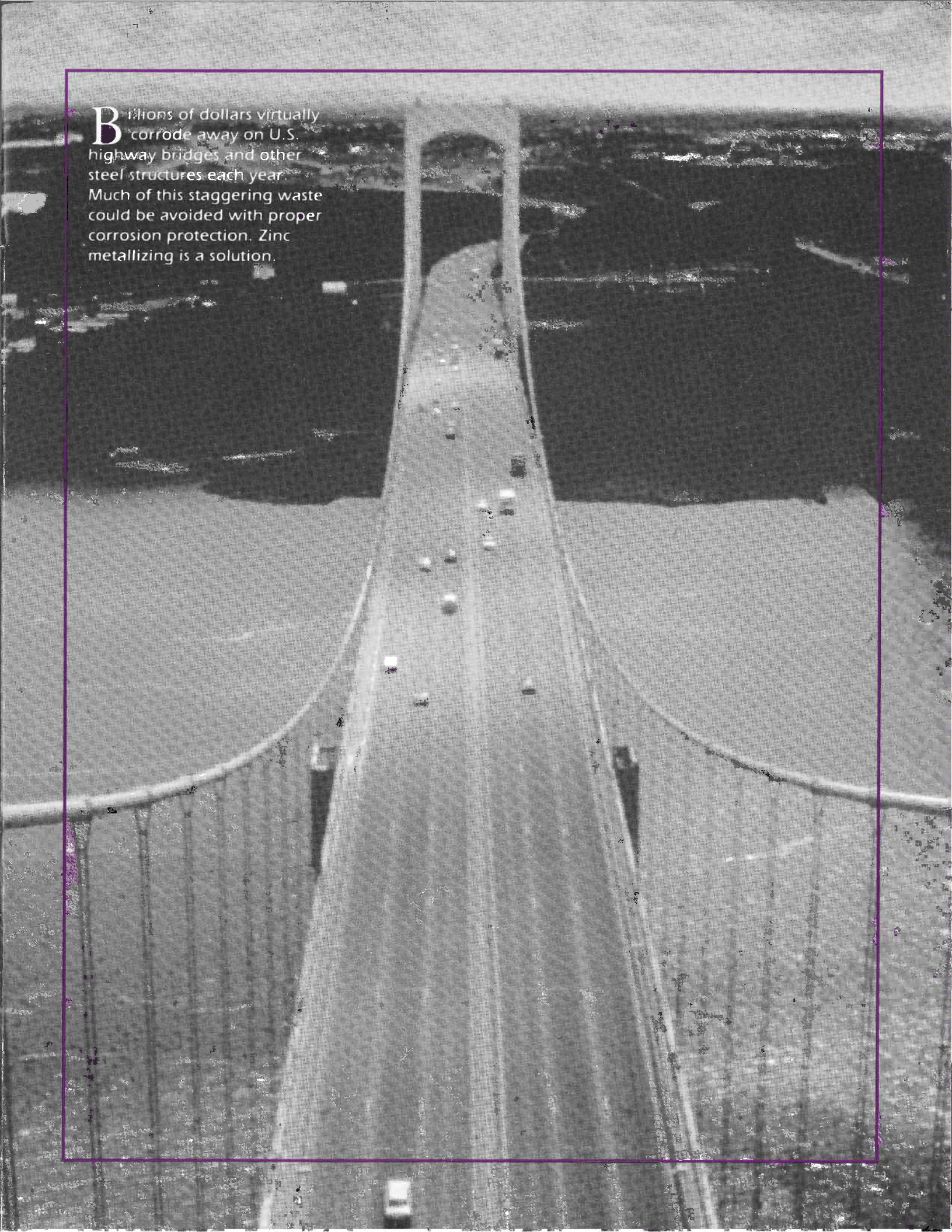


METALLIZING WITH ZINC

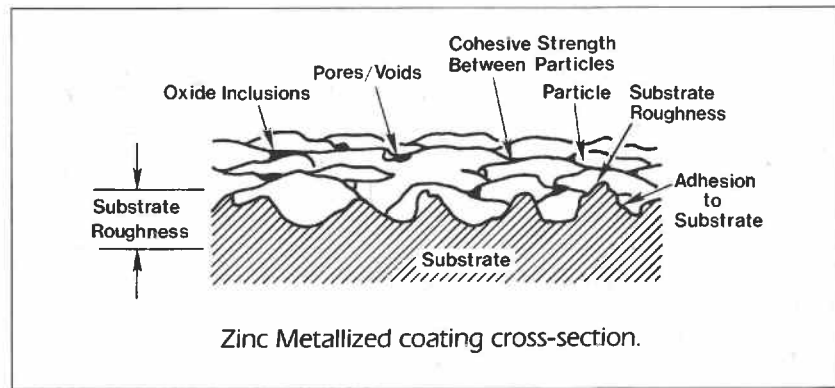
THE PLATT BROTHERS
& COMPANY

Billions of dollars virtually corrode away on U.S. highway bridges and other steel structures each year. Much of this staggering waste could be avoided with proper corrosion protection. Zinc metallizing is a solution.



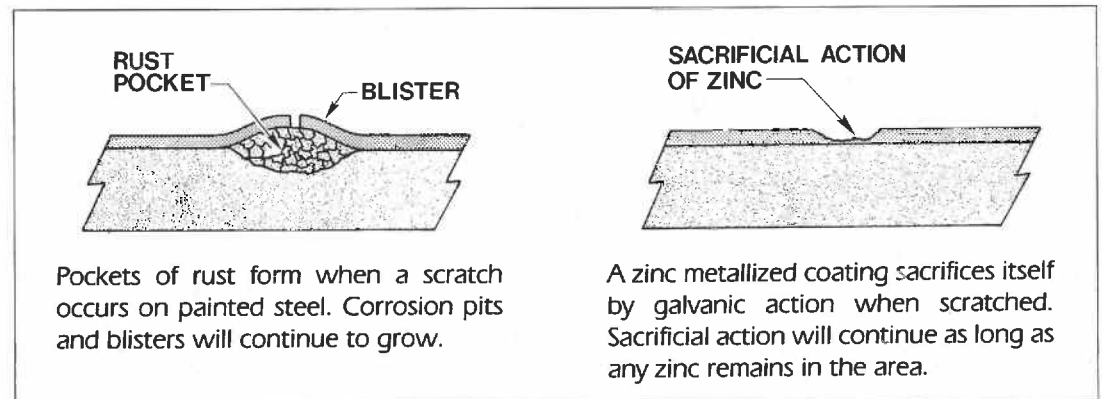
ZINC METALLIZING

A process ahead of its time.



Zinc Metallizing is a versatile process which melts Zinc or Zinc Alloy metals, and then rapidly propels the molten Zinc particles onto a prepared substrate, creating a lamellar or layered coating. Metallizing, or Thermal Spraying as it is often called, is a highly effective and proven method of corrosion prevention, giving galvanic as well as barrier coating protection to iron and steel.

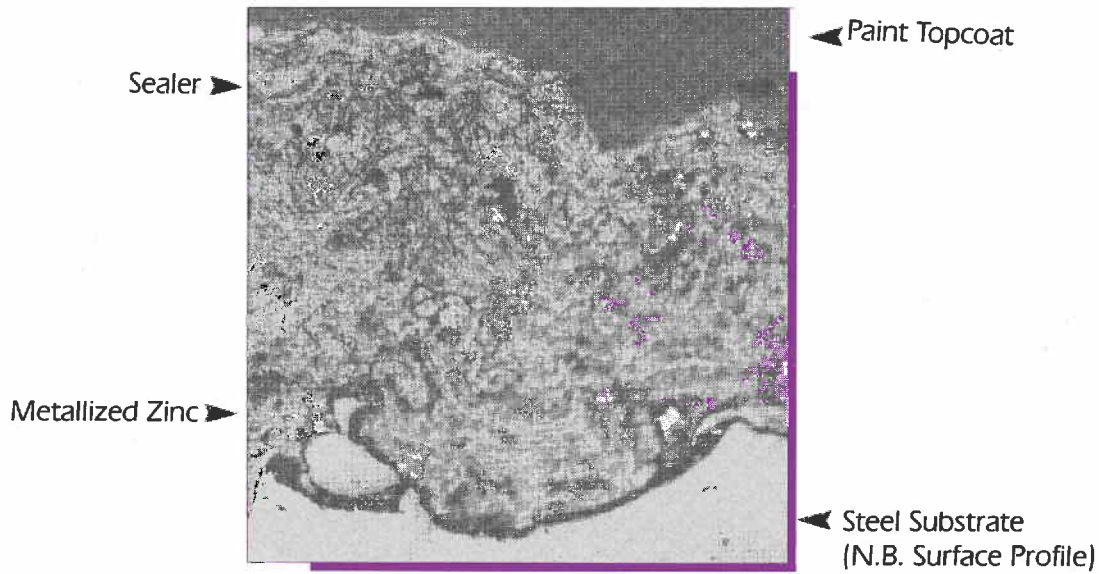
How Does It Work?



Most protective coating systems for steel function solely by acting as a barrier between the steel and the corrosive environment. If these passive and permeable barriers are damaged or penetrated, moisture and oxygen can reach the steel causing rust and eventual coating failure. A zinc metallized coating also offers barrier protection; however, the electrochemical relationship between zinc and steel allows a zinc coating to give cathodic protection as well. A zinc metallized coating will protect the steel galvanically: it will corrode in preference to steel, continuing to protect as long as any zinc remains in the immediate area.

The surface of a metallized coating permits excellent adhesion of sealers and topcoats. The effect of this combination is a synergistic coating system which will protect the underlying steel and require little or no maintenance for many years.

Metallized Zinc System 250x



METHOD OF PREPARATION ON STEEL

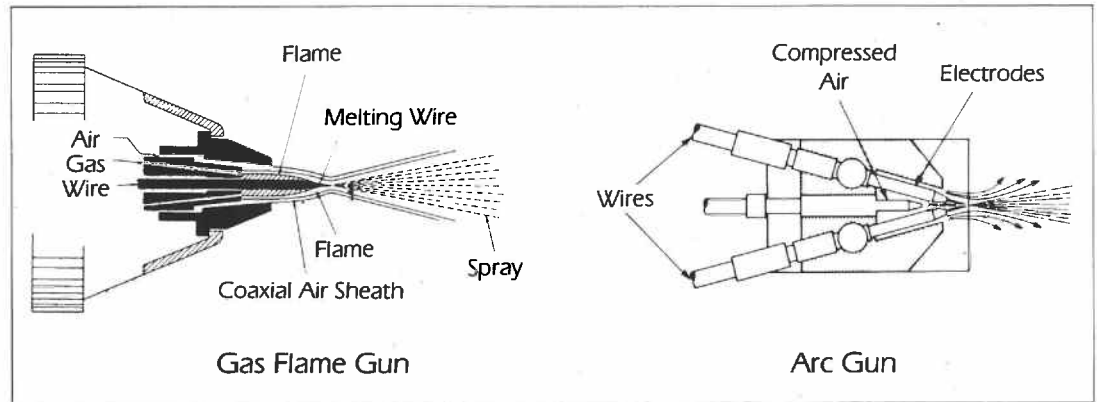
As with any coating process, proper surface preparation is essential. The blast abrasive used must clean the steel surface of old paint, rust or mill scale and provide a surface anchor tooth profile of about 2.0 to 4.0 mils (50-100 microns). This type of preparation is necessary to achieve the mechanical bond of a zinc metallized coating. The result will be an adhesive and cohesive strength of several thousand pounds per square inch between the substrate and the coating.

Case hardened steel surfaces require extra care during surface preparation to assure a proper bond and a lasting coating.



Proper surface preparation of both steel and concrete is essential for adhesion and long life.

METHOD OF APPLICATION



Types Of Metallizing Equipment

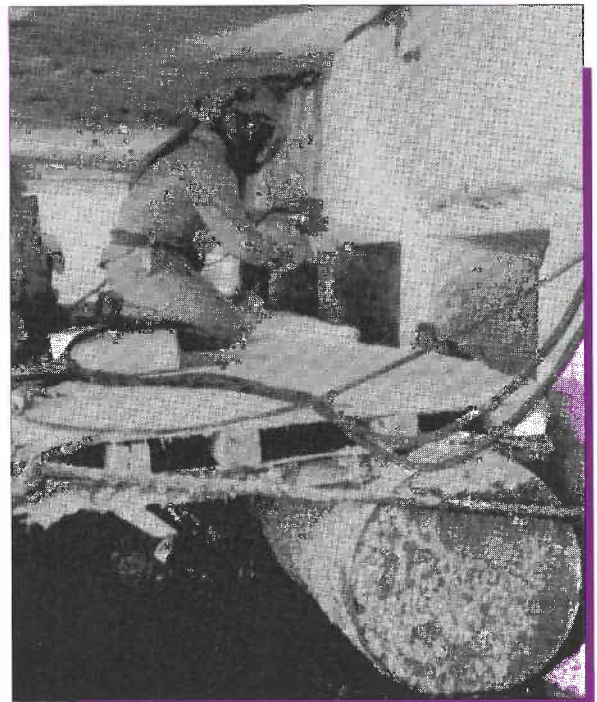
The Zinc or zinc alloy wire is usually sprayed by using electric arc or combustion flame equipment.

Arc Spray Equipment: The electric arc process continually feeds two electrically charged wires into an arc, melting the Zinc. Compressed air then strips pliable particles of Zinc from the wire tips and propels the molten metal onto the surface.

High Spray Rate Arc Equipment: recent technology has developed this equipment specifically for corrosion protection applications. This light-weight equipment is capable of spraying Zinc wire at over 100 pounds an hour.

Combustion Flame Equipment: The oxy-fuel flame gun melts a single wire which is then atomized and deposited onto the steel surface.

Applications of Zinc and Zinc alloy coatings can be easily controlled by the equipment operator to provide a thickness of .002" to .030". This is important when considering atmospheric conditions will dictate the protective thickness required. For example, a very long life or highly corrosive conditions necessitate a thicker coating. Edge coating, a normally difficult task for all coating systems, is easily and efficiently achieved using the Zinc Thermal Spraying process. The use of sealers and/or topcoats (vinyls, urethanes or phenolics, for example) over a zinc metallized coating will further protect the surface and usually provide an even longer life of the coating system. Again, environmental conditions will determine the use and type of sealers.



In A Word . . . Longevity

Proven Long Term Protection: A sealed, zinc metallized coating can realistically provide 30 years of corrosion protection in rural environments and 15 to 25 years in urban and coastal areas. Severe atmospheric conditions will not rust steel protected by a zinc metallized coating.

Versatility: Coating thickness can be varied. This is important because the protection achieved is directly proportional to the weight of a zinc metallized coating. Severe atmospheric conditions and longer life require an increased coating thickness. The thickness can also vary on different areas of the same structure, such as troublesome flange edges, giving needed extra protection. Applied zinc metallized coatings will not mudcrack, run or sag when applied over .006" thickness.

No Drying/Curing Time: A zinc metallized coating bonds instantly allowing for immediate application of wash primers and sealers. Because there is no drying time, additional labor costs, lengthy setup times and constant maintenance scaffolding costs are reduced or eliminated.

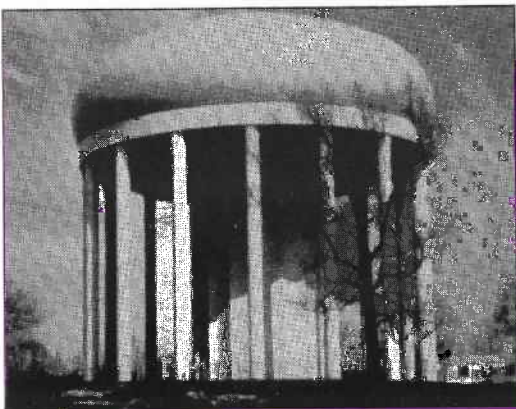
No Size Limitation: Whether the job is in your shop or in the field, there is no limit to the size of the structure to be coated with Zinc.

No Warpage: The surface being coated remains at ambient temperatures. Therefore, a zinc metallized coating does not distort the shape of the steel, nor will it affect its metallurgical structure. Weld embrittlement, overtempering and steel strength losses are not a concern when metallizing with zinc.

No VOC's: In today's concerns for the environment, the coating industry is interested in protecting the infrastructure without damaging the environment around it. A zinc metallized coating is inorganic and does not contain volatile organic compounds that can harm the environment.



Fixtures such as bridge railings that cannot be removed for galvanizing can be sprayed with Zinc or Zinc/Aluminum for corrosion protection.



One of several potable water tanks with a zinc metallized interior.

THE ADVANTAGES OF ZINC METALLIZING

THE LIFE EXPECTANCY OF A ZINC METALLIZED COATING

The corrosion protection of zinc metallizing is documented in a report sponsored by the American Welding Society Subcommittee on Metallizing. This report summarizes the periodic evaluations of more than 4,000 test panels which were exposed to varied environments, at eight different test sites during a 19 year period. The most significant conclusion was "Many of the zinc metallized coatings looked as though they would continue to succeed for another 19 years."¹. The results also recommended Zinc coatings "as a means of extending the life of such iron and steel structures as bridges"².

Type of environment, proper surface preparation, thickness of coating, use of sealers and/or topcoat, and the nature of the structure are equally important elements when considering Metallizing. Each job must be treated individually, as requirements for protection may differ.

There are hundreds of case histories relating to the longevity of zinc metallized coatings on steel. Bridge structures, interiors of potable water tanks, pipelines and dam locks show, in some cases, over 30 years of service without major repair.

The British Standards Institute sites sealed zinc metallized coatings to last 20 years or more in salt splash zones, the harshest environment for coating systems.



Ridge Avenue Bridge in Philadelphia, Pennsylvania Zinc Metallized in 1930's. To date this bridge is still essentially corrosion free.

Metallizing was invented in 1910 and brought to the United States in the 1920's. Pictured here is an operator in Philadelphia in the 1930's.

¹SSPC - Painting Manual, Vol. 1 Good Painting Practices

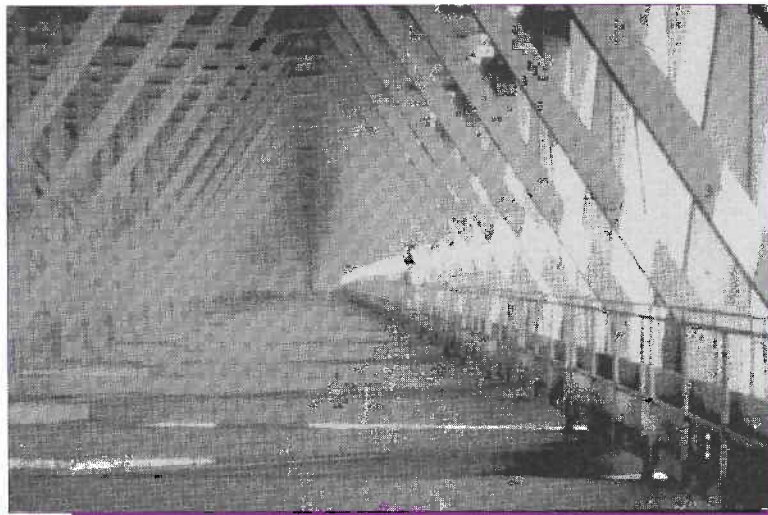
²AWS - Corrosion Tests on Flame - Sprayed Coated Steel - 19 Year Report

Things To Consider When Choosing A Corrosion Coating

No continuous maintenance is required with a properly applied zinc metallized coating. A single application will give years of lasting corrosion protection.

Initial Cost. Labor costs, interest rates and general inflation all contribute to the final cost to the owner or taxpayer. The installed cost of a zinc metallized coating will vary, whether the job is a field or shop application. Additionally, a zinc metallized coating is comparable in cost to a three coat paint system with a longer life cycle cost, thus ensuring a cost savings during the service life of the structure.

Maintenance Costs. Labor rates along with the cost of removing the structure from service for maintenance becomes more and more costly every year. For example, the Ministry of Transport in Canada decided to metallize the Pierre LaPorte Bridge over the St. Lawrence River, in Quebec after analyzing the various coating methods available. Metallizing is expected to save millions of dollars in paint, labor maintenance and scaffolding costs alone.



Pierre LaPorte Bridge, Quebec, Canada.
World's largest on-site metallizing project to date.



The operator can control the coating thickness in one application. Zinc metallized coatings are dry on contact.

LIFE
CYCLE
COSTS

ZINC AND ZINC/ ALUMINUM ALLOYS

Zinc

Plattzinc® protects steel from corrosion by three basic mechanisms:

1. Simple barrier protection.
2. The formation of corrosion products such as zinc oxide, zinc hydroxide and zinc carbonate which insulate both the coating and the steel from the environment.
3. Galvanic action.

Zinc/Aluminum

Alloying zinc with 15% Aluminum has been proven to be most effective in harsher environments. Aluminum protects steel by forming an inert barrier to resist industrial pollutants such as sulphur dioxide. Tests and field experience has shown Zinc/Aluminum to successfully protect steel from sodium chloride, found in marine atmospheres and used for highway deicing.

Plattzinc® 85/15 has typical bond strengths of over 3500 psi on grit blasted steel, higher than either pure zinc (1300 psi) or pure aluminum (2800 psi). The maximum service temperature of zinc/aluminum is 600°F, considerably higher than 140°F for pure zinc. The deposit efficiency is generally much higher than pure zinc, covering more square footage per pound of material which reduces labor costs and increases productivity.

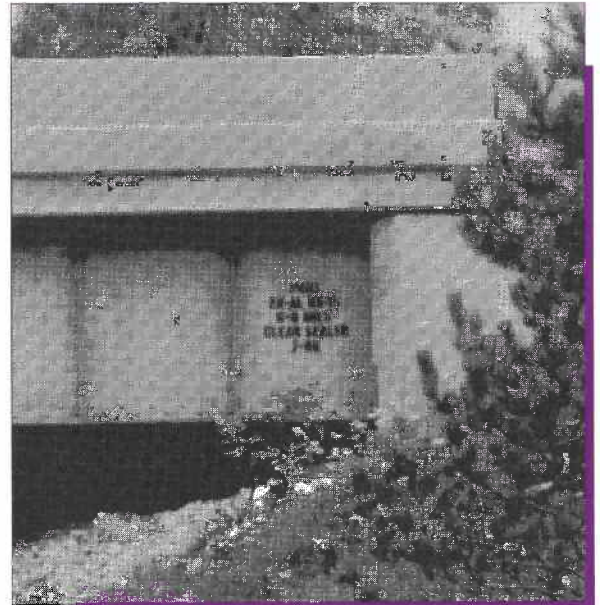
Material Application

Pure Zinc

- Rural atmosphere.
- Alkaline industrial atmosphere (pH 5.0-12.0).
- Fresh water immersion below 140°F (60°C).

Zinc-15% Aluminum

- Intended specifically for use in environments which require an extra degree of protection: marine atmospheres, bridges laden with deicing salts, and heavy industrial atmospheres.
- More forgiving than aluminum in surface preparation.
- Most versatile material.



85/15 Zinc/Aluminum is used in areas where heavy deicing salts can accelerate steel structure corrosion.

Protecting Concrete Infrastructure

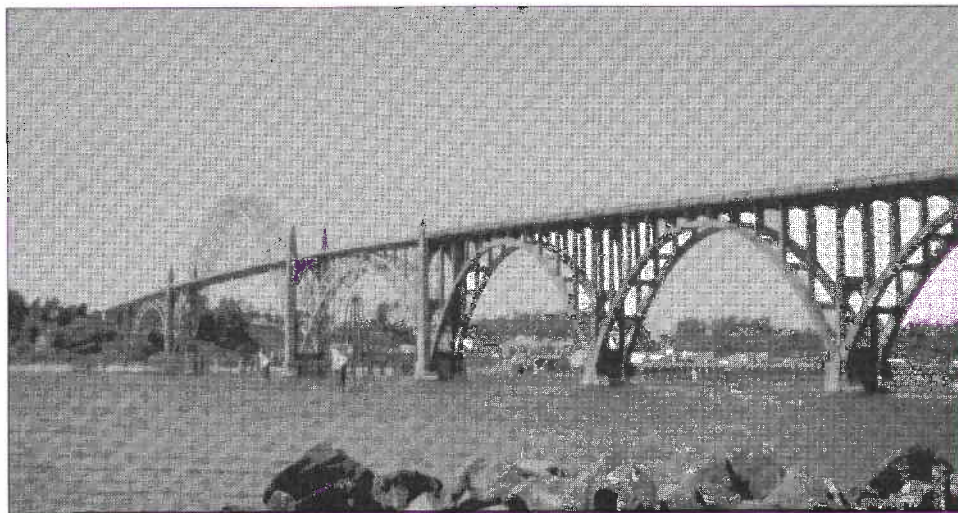
Since the late 1950's, there has been growing concern about the corrosion of reinforced steel in concrete structures. Research has revealed that the corrosion process can be slowed or eliminated by controlling the galvanic current that is generated within the concrete when the rebar rusts. This current reversal is called cathodic protection.

Concrete acts as a barrier material protecting the embedded steel rebar by developing an oxide layer of the metal's surface. When salt water or highway deicing salts permeate the concrete or some accelerating curing agents are used in the original concrete mixture, it destroys the passivated layer and corrosion begins. The buildup volume of rust causes the concrete to spall exposing the rebar to further corrosion and eventual structure failure.

Zinc metallizing's role in cathodic protection is as a conductor of electrical current to introduce and distribute a flow of positive charges from an external power source, through an electrolyte (a moist medium such as wet concrete) to the steel rebar, reversing the natural corrosion current flow, thus stopping the corrosion process. Installed as a coating on the surface of the concrete, the zinc is as close as practically possible to the rebar, thereby using the least amount of electrical current necessary to provide cathodic protection.

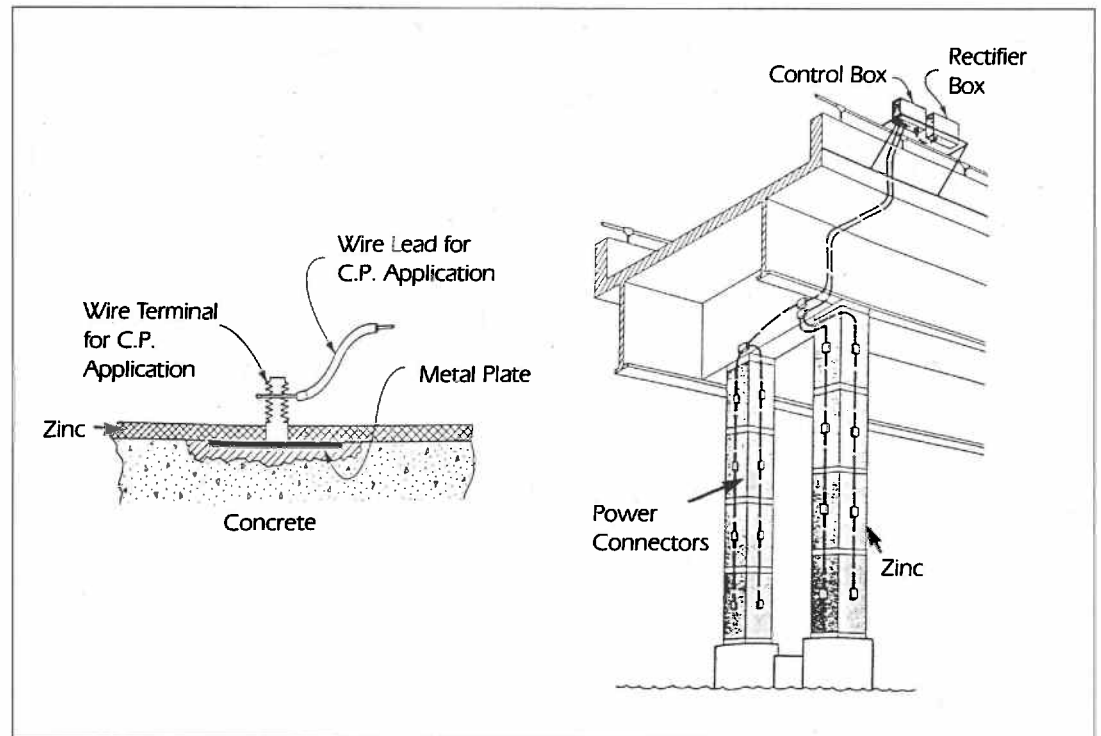


Cape Creek Bridge, Oregon. The first complete structure to use zinc metallizing in a cathodic protection application.



Yaquina Bay Bridge, Oregon

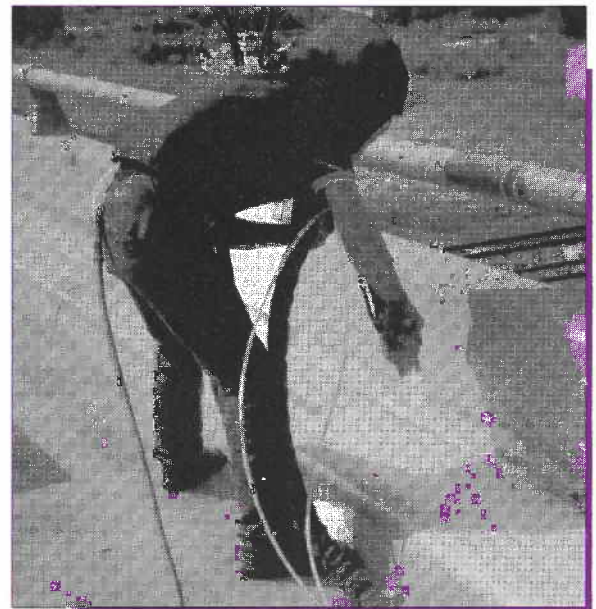
ZINC
THERMAL
SPRAYING FOR
CATHODIC
PROTECTION
OF STEEL
REBAR IN
CONCRETE



Based on research and development, a patent covering this cathodic protection system was issued to the California Department of Transportation (CALTRANS). Their development included experimentation with a number of current distributors sprayed on several bridge structures. This work indicated that zinc thermal spraying was the most versatile and economic method to distribute the current for several reasons:

- Zinc is an excellent conductor of electricity.
- Zinc is easily sprayed in thicknesses necessary for the application (usually 20 mils or more).
- Vertical structures, such as piers, are easily sprayed.

Since CALTRANS work, many Departments of Transportation have adopted this method of cathodic protection. This system is also recognized by the Federal Highway Administration as a practical method of controlling rebar corrosion in concrete. Several installations have taken place since the early 1980's and all experiences have been positive. In fact, the State of Oregon has installed this system on the Cape Creek bridge, the largest entire structure to date to be included. Many other bridges are scheduled for cathodic protection utilizing zinc thermal spraying. Other applications include parking garages, boat piers, retaining walls and dams.



Cathodic Protection of rebar in concrete application being done in Big Springs, Texas. Thicknesses of 20 mils or more can be applied without delamination.

The Platt Brothers & Company

The Platt Brothers & Company, located in Waterbury, Connecticut, is a primary source of high quality Zinc and Zinc Alloy wire used for metallizing. Platt Brothers & Company has been incorporated since 1876 although the original parent firm, A. Platt and Company began as a grist and sawmill in the early 1800's. Today, Platt Brothers is a major international source for zinc, zinc based alloys, strip, rod, wire and other products.

The Platt Brothers & Company is proud of its tradition and continues to enjoy a reputation for unsurpassed quality and service, and for consistently fair and honest dealings with all business associates. We are committed to the Zinc Metallizing process as a practical and effective means of preventing corrosion.

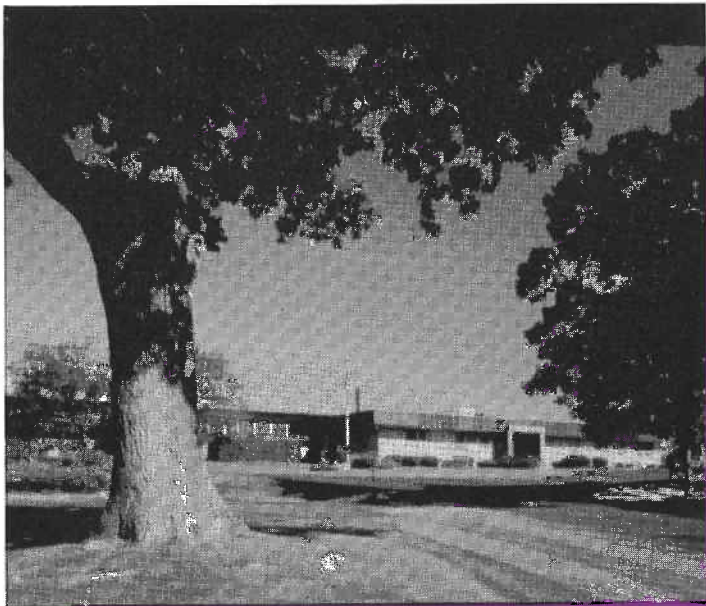


The Platt Brothers & Company
Circa 1878

Other Platt products include:
Plattline™ Zinc Ribbon Anodes.
A maintenance-free method

to protect buried or immersed pipelines and above ground storage tank bottoms from corrosion. This versatile product is also used to dissipate induced A.C. current on coated steel pipe and to ground test stations and valves subject to A.C. current and fault current.

Plattzinc® Zinc Cut Wire Shot. A non-ferrous abrasive designed specifically to deburr and temporarily protect zinc and aluminum die cast parts.



The Platt Brothers & Company Headquarters
Waterbury, Connecticut

PRODUCTS
THAT
PROTECT

NOTES

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While the data is believed to be accurate and will serve as a guide to experienced contractors, the results achieved in any case depend on several factors, including the structure chosen for coating, the condition of the surface to which the coating is applied, the skill of the contractor making the application and the environmental conditions to which the treated surfaces are exposed. All recommendations and suggestions are made without guarantee.