



# HOT DIP GALVANIZING PARKING STRUCTURE

An Economical and Reliable Option

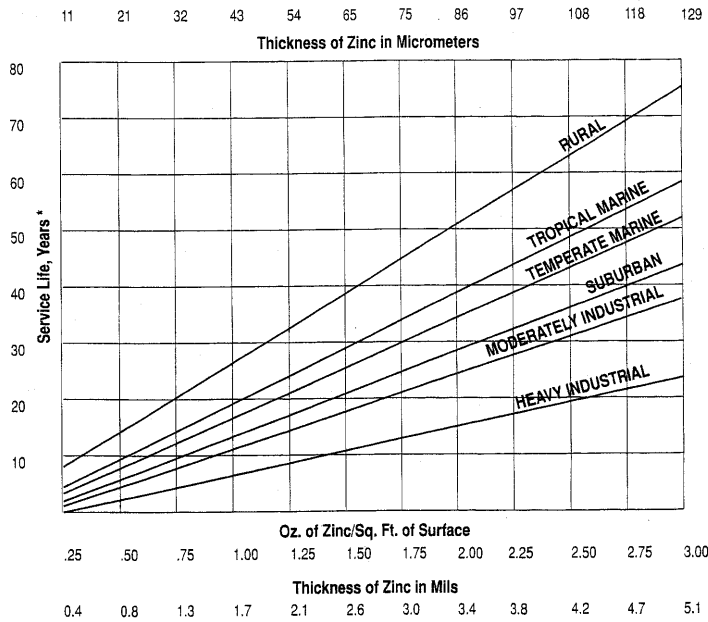
Howard Levine CSI, CDT

*(Above)  
Manchester, NH  
airport parking garage  
(Engineer:  
Hybrid Parking  
Solutions)*

**H**ot dip galvanizing has been protecting steel from corrosion for centuries. Galvanizers understand the problems and have developed creative solutions. The problems of the parking industry are severe, but solutions achieved in other industries have enabled galvanizers to meet the challenge.

## LIFE OF PROTECTION VS. THICKNESS OF ZINC AND TYPE OF ATMOSPHERE

\* Service Life is defined as the time to 5% rusting of the steel surface.



The corrosion problems facing the architectural and engineering community in the parking structure industry are monumental. With the cutbacks in client operating expenses and the tightening of maintenance budgets, it is essential to take whatever actions necessary to control the escalating spiral of maintenance. All involved would like to reduce and keep under control this massive cost. According to Alan Simon of Hybrid Parking Solutions of Watertown, MA "Hot dip galvanizing is an option often preferred where no maintenance is desired. The longevity and self-healing aspect of galvanizing is attractive."

### THE GALVANIZING PROCESS

There is an inherent difference between hot dip galvanizing and other protective coating systems. Basically, steel is protected from corrosion through either barrier or cathodic methods. Barrier protection occurs when the protective mechanism acts to prevent the steel

from coming into contact with the contaminant. How well it does its job totally depends upon the three "legs" of the coating triangle: surface preparation, application and material. If the steel has not been prepared properly or if the application is done in less than ideal conditions, the coating will fail and corrosion will result. Paint is one example of the barrier method.

Cathodic protection is a process whereby the metal is protected from corrosion by changing an element of the corrosion circuit, introducing a new corrosion element and ensuring that the base metal becomes the cathodic element of the circuit. A form of cathodic protection is called the sacrificial anode method. In this system, a metal anodic to the metal to be protected is introduced into the corrosion circuit and becomes the anode. The protected metal then becomes the cathode and will not corrode. In virtually all electrolytic reactions encountered in everyday use, zinc is anodic to iron

and steel. By forming a metallurgical bond between the coating and the underlying steel, hot dip galvanizing provides cathodic protection as well as barrier protection.

Furthermore, since the hot dip galvanizing process calls for the steel to be immersed into a bath of molten zinc and other earthly metals, it is being protected on 100% of its surface. This protection is critical and unavailable in other types of corrosion protection. By design, the steel in most parking structures will be exposed, and in many cases, directly exposed to the weather. It really serves no useful purpose to have a wonderful design, fabricated perfectly, with "rust bleed" staining the steel or adjacent material. This discoloration or "rust stain" will lead to a perception of inferior workmanship and lack of maintenance on the part of the public. As much attention must be paid to this particular issue as to the proper fabrication techniques. Since many garage components are tubular, it is important to specify a corrosion protection system that will not only protect the steel on the outside but on the inside as well.

### AESTHETIC CONSIDERATIONS

In addition to providing corrosion protection, hot dip galvanizing's pleasing gray color meets many visual requirements as well. Typically, galvanized steel will oxidize to a uniform patina. However, when the need for color is required for safety reasons or the design calls for a particular color scheme, galvanized steel can be successfully painted. By following an established formula of preparing the galvanized steel, applying the primer within the appropriate conditions and time frame and other proven techniques, galvanizers can add the beauty and additional longevity of a high performance paint system over galvanizing.

*E.D.I.C. parking garage.  
(Engineer: Engineers  
Design Group)*



### COST CONSIDERATIONS

Many Public Agencies and private developers are now mandating that the selection of material be reviewed not only for initial cost but on a life-cycle basis as well. Tom Arthur, President of Engineers Design Group, Cambridge, MA, says "Many of our clients, particularly in the public sector, have been able to raise funds for new construction but have no budget for maintenance and repair. Hot dip galvanizing allows us to provide a good looking structure which will require virtually no upkeep over its extended life".

Looking at the two primary corrosion protection systems, galvanizing and paint, it i

been blasted to a Society for Protective Coatings (SSPC) Specification of at least SP 10. According to a bi-annual coating economics survey published by the National Association of Corrosion Engineers (NACE -1996), the estimated cost for shop application of this paint system ranges from \$443 -\$559 per ton.

Based on a moderate exposure to corrosive elements in the atmosphere, the galvanized system will have a projected life (to 5% surface rust) in excess of 40 years. The paint system, based on the same NACE report, will require repainting in approximately 11 years. Therefore, when designing a structure with an anticipated life of 40 years, it is necessary to include

future costs of repainting as part of the total corrosion protection costs.

Maintenance painting consumes a significant and escalating portion of operating and maintenance budgets. As more focus is placed on controlling maintenance costs, a reliable, low-maintenance corrosion protection system can be estimated by using commonly accepted economic formulas.

*Howard Levine CSI, CDT, is Senior Vice-President for Marketing at Duncan Galvanizing in Everett, MA.*





*East Cambridge garage  
(Engineer: Hybrid Park-  
ing Solutions)*

### Some of the advantages of hot dip galvanizing in parking structures are:

- **Life expectancy.** The life expectancy of hot dip galvanized coatings is a proven, measurable factor. As zinc protects steel by sacrificing itself, the life of the coating can be accurately predicted by dividing the existing coating thickness by the average coating loss per year. The longevity calculations are based on empirical data, not theoretical. The result is the life to first rust (not failure). In most cases, the calculated life of most areas exceeds 40 years.

- **Widely used.** Hot dip galvanizing has been extensively used in the industry. Sign supports, landscape components, highway architecture, noise barriers and many other items are currently specified to be galvanized.

- **Easy maintenance.** When galvanized, the galvanizer has sole responsibility for the coating sys-

tem. Since no recoat will be required, the problem of "mixed systems" for maintenance doesn't occur. Maintenance of records for prior coatings is simple—it was galvanized.

- **Assurance of adherence & quality.** The coating adherence and quality are simple to inspect and verify. If the base steel isn't properly cleaned and prepared, it will not coat. Hot dip galvanizing is the only corrosion protection system that guarantees that the steel is perfectly clean before application of the coating. There cannot be a metallurgical bond between the steel and zinc unless the steel is 100% contaminant free. Once coated, it will adhere. Simple magnetic gauges that are readily available measure thickness.

- **Inside & outside protection.** Hot dip galvanizing is the only

system available that protects the steel on the inside as well as the outside. This is especially important in the case of tubular materials, which cannot be maintained on the interior. Left untreated, the corrosion can rapidly spread from the interior of the tube to the outside ultimately resulting in a structural failure of the component. By coming in contact with moisture, the untreated steel will "bleed" onto the ground, concrete or other appurtenance. However, occurring long before a loss of structural integrity will be an aesthetic failure. On schedule. Galvanizing is a factory process not dependent on weather or other external conditions. This allows fabricators and contractors the ability to accurately schedule site deliveries and erection times in addition to eliminating delays.