

fasteners. The design should be arranged so that water flows from the galvanized surface onto the brass or copper surface and not the reverse.

### Cathodic protection of damaged areas

Where continuity of a galvanized coating is broken by cut edges, drilled holes or surface damage, small areas of exposed steel are protected from corrosion cathodically by the surrounding coating as discussed on page 10. No touch up is necessary, and cathodic or sacrificial protection continues for many years. In service, zinc corrosion product tends to build up in coating discontinuities, slowing the rate at which the surrounding coating is consumed in protecting a damaged area.

Practical examples of this cathodic protection phenomenon include exposed cut edges in galvanized steel roofing and cladding, and the uncoated internal threads of certain fasteners.

In standard building practice cut edges in galvanized sheet are not treated in any way and when failure of the coating finally occurs after long exposure, corrosion normally is relatively uniform across the sheet surface without concentration at edges or fastener holes. Similarly, the uncoated internal threads of large galvanized nuts are protected from corrosion by the zinc coating on mating bolts and studs.

When substantial coating damage has occurred to a galvanized coating during handling, fabrication or erection, coating repairs are necessary as detailed page 45.

### Comparative properties of coatings\*

The following tables provide a useful assessment of the properties and characteristics of various coatings for steel in a range of applications and environments.

	Key	Galvanizing	Paint	Bitumen	Vitreous enamel
Corrosion protection	(1)	A	B	B	B
Electrochemical protection	(1)	A	D	D	D
Durability in atmosphere	(1)	A	B	C	A
Durability in water	(1)	B	B	A	A
Adhesion	(1)	A	B	B	A
Resistance to damage	(1)	A	C	C	D
Resistance to abrasion	(1)	A	C	C	A
Size limitations	(2)	B	A	A	C
Risk of deformation	(2)	B	A	A	B
Inspection possibilities	(1)	A	B	B	C
Initial costs	(3)	B	B	B	C
Maintenance costs	(3)	A	C	B	A

	Key	Galvanizing	Zinc spraying	Zinc plating	Zinc rich paints	Mechanical plating
Alloying with base steel	(1)	A	D	D	D	D
Durability of coating	(1)	A	A	C	C	B
Cathodic protection	(1)	A	A	A	C	B
Resistance to mechanical damage	(1)	A	B	C	C	C
Resistance to abrasion	(1)	A	B	C	C	C
Piece size limitations	(2)	B	A	C	A	C
Risk of deformation	(2)	B	A	A	A	B
Ease of inspection	(1)	A	C	C	C	C
Initial costs	(3)	A	B	C	B	B
Maintenance costs	(3)	A	A	D	B	C
Suitability for painting	(1)	B	B	B	B	B
<b>Key</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>			
	A Very good	A None	A Very low			
	B Good	B Little	B Low			
	C Poor	C High	C High			
	D Very poor	D Very high	D Very high			

\*R. Thomas, 1980 (modified).

## Galvanized coatings for buildings and structural steel

A vital factor to be taken into account in the assessment of coating systems for buildings and structural steel is the relative effectiveness of coatings. No protective coating applied to a structure after completion can provide the same protection as a galvanized coating which covers the entire surface of all components, automatically protecting areas to which later access may be difficult or impossible.

When steel members, fascias and other components which are to receive a final decorative or protective coating are galvanized, no surface deterioration will occur during storage, handling, erection or waiting time until completion of the project. Galvanized coatings can save considerable time and cost which might otherwise be necessary for rectification of damaged or corroded surfaces.

**Exposed frame structures.** Open frame industrial steel structures which are not protected by roofing or cladding are particularly vulnerable to corrosion. Normally they are sited in industrial areas and frequently, maintenance access is difficult.

In these circumstances no other coating system matches the economy/performance of galvanized coatings. Even in the most severe atmospheres a duplex system of galvanizing-plus-paint will usually provide the best practical balance between cost and the longest possible maintenance-free operating period. The galvanized coating provides a stable base for the paint film, ensuring far longer coating life, and the metallic zinc protects the steel in areas where the paint film may be damaged through impacts or abrasion in service. The synergistic effect gained from the galvanizing-plus-paint combination is discussed on page 65.

**Internal steelwork in industrial buildings.** Galvanized coatings are ideal for many structures which house industrial processes; in structures where the humidity of contained air is high, as in breweries, paper manufacture and sewage treatment; and in food processing and other areas where cleanliness is essential. Whether used alone or in combination with paint coatings as discussed above, galvanized steel will provide very low total long term cost, with longer maintenance-free service periods.

### Galvanized lintels or arch bars

Once rusting begins in a lintel or arch bar, it cannot be stopped. The exposed surface may be repainted but there is no treatment for concealed areas.

The advance of corrosion may continue until the expansion of steel corrosion products causes cracking of brickwork and ultimately, serious structural damage. In the paper 'Arch bars and angle lintels for brick walls' Australia's Department of Housing and Construction Experimental Building Station points out that:

'Arch bars and angle lintels are vulnerable to corrosion. Cracking of brickwork because of the build-up of rust is very common and is a more serious consequence of corrosion than is the deterioration of the lintel itself. However, hot-dip galvanizing (zinc coating) is so readily available that it could well be adopted as standard practice for all arch bars...'

Australia's Model Uniform Building Code Section 47-7 discusses suitable corrosion protection for lintels as being '... not less effective than galvanizing'. Galvanizing provides practical, economic protection for lintels in all external applications and is particularly valuable near the sea coast.

Galvanized lintels are widely available in stock lengths and sections coded to user needs.