Life Cycle Costing

galvanizers ASSOCIATION OF AUSTRALIA

The GAA Life Cycle Cost Calculator provides a practical cost comparison of hot dip galvanizing and standard paint systems over the design life of a structure, including the durability of each coating, the estimated total initial cost and maintenance costs for each system.

- ☑ Free and easy to use web based calculator: http://lccc.gaa.com.au/.
- ☑ Offers specifiers and asset owners a simple means of assessing the cost-effectiveness of alternative protective coatings for steelwork.
- ☑ Based on independent costings & durability estimates for paint systems.
- ☑ Hot dip galvanizing often has the lowest initial cost and in most cases where long term corrosion protection is required, it also provides the most cost effective coating solution.

*More information is provided in **The Concept of Life Cycle Costing for the Corrosion Protection of Steel** available from the Galvanizers Association of Australia (www.gaa.com.au) and from NACE Paper #4088, **Expected Service Life and Cost Considerations for Maintenance and New Construction Protective Coating Work** at www.nace.org.*

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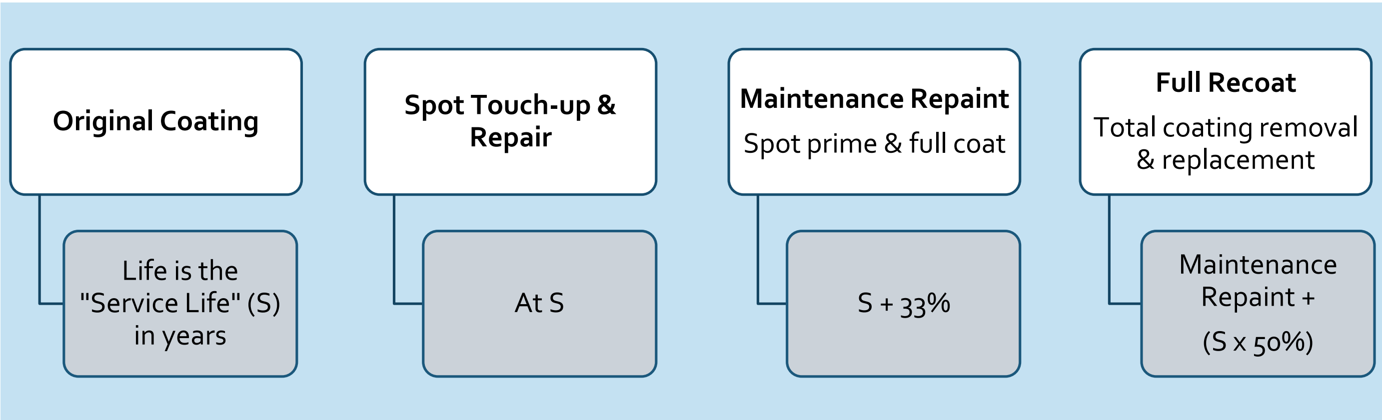
Coating Maintenance

All coatings need maintenance during the life a structure – some sooner than others. The **service life** of a coating is never the same as the **design life** of the structure. However, most coatings degrade slowly, allowing for several cycles of maintenance prior to a full recoat, and, with suitable maintenance, most coatings can be maintained to ensure the structure remains free of significant corrosion for the design life of the structure.

The first step in a maintenance cycle for a coating is usually is a spot touch up at the end of the service life when the surface shows around 5% red rust. After another period, typically around one third of the original service life of the coating, a more complete maintenance repaint is undertaken, while after another period of service, at around half the original service life, a full recoat is required. These steps are shown in the graphic below.



Life Cycle Cost Examples

To show how maintenance requirements for coatings affect the real cost of ownership of a structure over time we've outlined below a few typical examples and shown the ***net present value (NPV)*** results on a graph and in a table on the following page.

NPV is a standard financial calculation which involves the use of interest rates, inflation rates and taxation impacts, to test the benefit of spending less now on coatings (minimum first cost approach) against the cost of future maintenance (*see page 4 for the details of how NPV is calculated*).

Coating System Examples	
System Details	**Specification and Nominal Coating Thickness**
Hot dip galvanized	AS/NZS 4680 HDG600 Minimum average = 85µm
Inorganic zinc Inorganic zinc silicate (solvent-borne)	AS/NZS 2312.1/IZS1 Total DFT = 75µm
Polyurethane Primer: Zinc rich epoxy Intermediate: Epoxy Top coat: Polyurethane	AS/NZS 2312.1/PUR4 Total DFT = 250µm
Alkyd Primer: Alkyd Top coat: Alkyd	AS/NZS 2312.1/ALK 3 Total DFT = 100µm

Design & Structure Details	
Design life = 50 years	Quantity of steel = 100 tonnes
Simple structure <15m in height	Typical mix of sections Average surface area = $25m^2$/tonne
Steel thickness >6mm	HDG cost = $600/tonne
Paint application carried out in the shop	Paint costs from NACE Paper #4088
Interest rate = 7%	Inflation rate = 4%

Corrosivity Categories		
C2	Low – typical warehouse	ALK3, HDG
C3	Medium – typical urban	IZS1, PUR4, HDG

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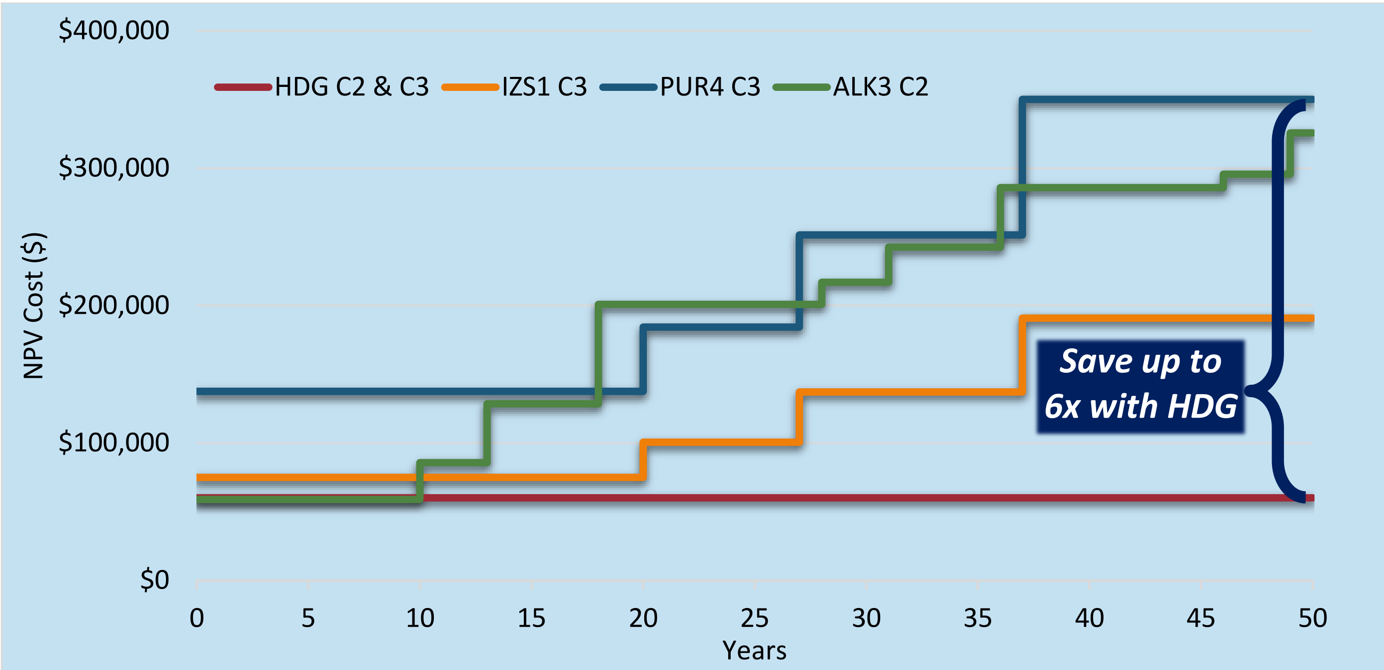

Above: NPV and predicted maintenance cycles of selected coating systems over the life of a structure in C2/C3 environments.

System	Average Service Life	Initial Cost ($'000)	Total NPV Cost ($'000)
Hot Dip Galvanized	>50 years	$60	$60
Inorganic Zinc	20 years	$75	$191
Polyurethane	20 years	$138	$350
Alkyd	10 years	$59	$326

- Alkyds require regular maintenance even in a low corrosivity environment
- Inorganic zinc silicates are similar in cost to hot dip galvanizing but are less durable
- Polyurethanes have a long time between maintenance cycles but cost more each time maintenance is required

Where corrosion protection is critical, hot dip galvanizing offers significant long-term cost savings over standard paint systems

The hot dip galvanizing and paint system costs in this example are not represented by the GAA to be the actual cost of any particular example, but do represent a typical cost for a range of applications. The example does not allow for other hidden costs such as loss of use of the asset while undergoing maintenance or special hazard containment requirements, where costs can vary widely depending on the project. In addition the micro-environment for an actual structure can add to or reduce the service life of a coating system changing the maintenance cycle times considerably. Your GAA member galvanizer will supply a quote for hot dip galvanized pricing based on the individual characteristics of your application, on request.

HOT DIP GALVANIZING

✓ Low First Cost ✓ Low Life Cycle Cost ✓ Less Maintenance

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Above: Breakdown of the single coat paint system in a low corrosivity environment (C2) on a large sun-shelter located in Tatura, Victoria.

Above: The same sun-shelter as on the left, showing the in-line galvanized purlins with the coating performing well, even though they are rain sheltered.

Computing the Life Cycle Cost (LCC)

Future maintenance costs will be impacted by inflation, which a LCC model accommodates by expressing future costs as shown below.

Net Future Value (NFV) is the current cost with inflation included, in other words, how much something will cost in inflated dollars *(i = inflation)* in the year *(n)* in which it occurs

$$NFV = Current\ Cost\ \times (1 + i)^n$$

Net Present Value (NPV) involves the use of interest rates, inflation rates and taxation impacts, to test the benefit of spending less now on coatings (minimum first cost approach) against the cost of future maintenance.

The present value ($NPVLCC$) of a coating will simply be the sum of the initial coating cost ($NPVIC$) and the repair or rehabilitation cost ($NPVR$), using the appropriate interest rate.

$$NPVLCC = NPVIC + NPVR$$

In addition to inflation, it must be kept in mind that increasingly stringent environmental and occupational health and safety requirements will influence the future cost of materials, energy and labour, as well as the cost of containment and residue disposal.

The initial costs are assumed to occur in year zero and require no interest rate, while repair or rehabilitation costs are assumed to occur at a single point in time in the future *(n = number of years)* and can be discounted back to the present by the use of the interest or discount rate *(i)*.

$$NPV = NFV\left[\frac{1}{(1 + i)^n}\right]$$

Of course, there may be multiple repair points for a coating system to reach the estimated project life and these need to be taken into account.

It is important to recognise the initial coating would normally be incorporated in the capital investment decision in Australia, while repairs and maintenance (for example painting) are usually tax deductible. This may affect the decision on the coating selected 'up front' and professional financial advice should always be sought when considering life cycle costing of a project.

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