International Zinc Association

57 galvanize
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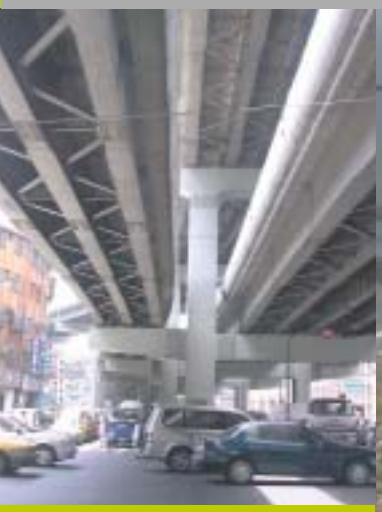
Zinc Galvanizing

BRIDGES IN ASIA

Recent vigorous economic growth in South East Asia has redistributed population and expanded industry and infrastructure building.

Development of rural and remote regions required innovative engineering solutions to gain right of way to new land for extractive purposes, industry, urban development and the critical arteries of commerce – roads.



Chung Cheng Overpass, Taiwan

Chung Cheng Overpass

In countries where, historically, seaports and rivers were the main outlets, roads and bridges emerged to provide heavy load capability and more reliable and productive transport.

In this respect steel bridges were found well suited to the pace of development and challenging terrain. Offsite completion, orthodox freight to site and relatively simple erection were invaluable aids to the rapid expansion of the time.

The use of steel in bridge construction is not new, and knowledge of the manufacture and behaviour of this material is well understood where advancing design use of steel has resulted in economical and aesthetically pleasing bridge structures. Steel offers particular advantages in that it can be shop fabricated, under controlled conditions, to almost any desired cross sectional geometry to meet the specific strength requirement at each site, often at completely undeveloped locations.

However corrosion prevention is one essential factor in the economic utilisation of steel where provision of the appropriate protective coating can influence initial and whole of life cost, eliminate maintenance and lost service time, and defer the replacement date of structures.

A wide variety of products have been used for this purpose, however, many bridges require permanent maintenance teams to sustain adequate steel protection.

In most environments, after-fabrication galvanizing provides very suitable corrosion protection for steel and has a range of coating characteristics which make it unique. These include an alloy hardness greater than mild steel, a self-inspecting process discipline and predictable life directly proportional to its heavy coating thickness. These result in a surface alloy with competitive cost, resistance to severe impact, extended service life and in turn reliability for use in engineering calculations.

This issue of *'galvanize!'* features the widespread use of hot dip galvanized steel bridges in the development of a number of South East Asian countries. Twenty-five years on, these are a tribute to many people and to the value of galvanized steel.

Linkou Bridge – Taipei (above, above right)

Note the corrosion distress on painted storage tanks of the power generating station immediately behind the bridge

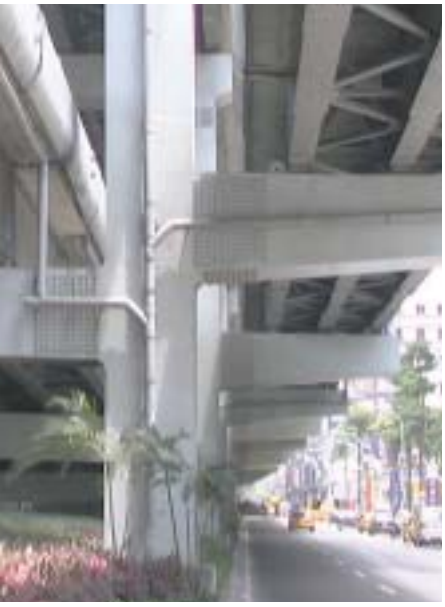
Taiwan

The Ma Tsao Bridge in Mount Yang Ming, North Taiwan, the earliest bridge to utilize after-fabrication hot dip galvanized steel, was opened in 1992. From then on, approximately 30 000 tonnes of steel and around 30–40 bridges have been hot dip galvanized. The most representative of these bridges are the Chung Cheng Overpass and the Linkou Bridge. There are now approximately 25 000 tonnes of bridges under construction which are the result of work by the galvanizing industry, with government and academia, in presenting proof of service of the hot dip galvanizing process, where security, low cost and reliability were crucial factors.

Taipei – Linkou Bridge

The Linkou Bridge is an 8-lane overpass bridge, 22.6 metres in width and 1065 metres in length, located in a non-sheltered environment adjacent to the seafront on the northeast coast of Taiwan. This girder type bridge utilized 7300 tonnes of galvanized 2 metre girders as well as 3030 tonnes of galvanized steel reinforcement to provide long-term corrosion protection in the salt-laden atmosphere of the Taiwan Strait.

Authority: Taiwan Highway Bureau



Chung Cheng Overpass

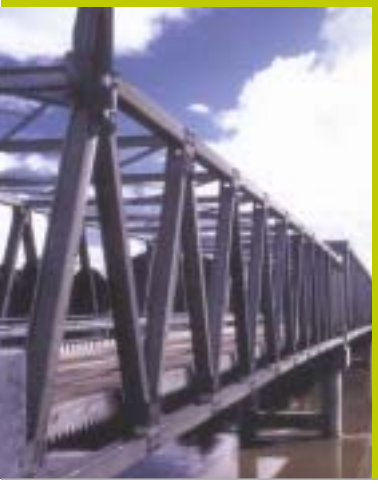
Taipei – Chung Cheng Overpass Bridge

The Chung Cheng Overpass Bridge, opened in 1996, has 6 lanes, is 24.9 metres wide, 1672 metres in length and utilizes 7000 tonnes of hot dip galvanized steel girders. Heavy vehicular usage across the bridge and roads beneath, and the confined nature of the location with buildings in such close proximity, would make any bridge maintenance a major logistical problem.

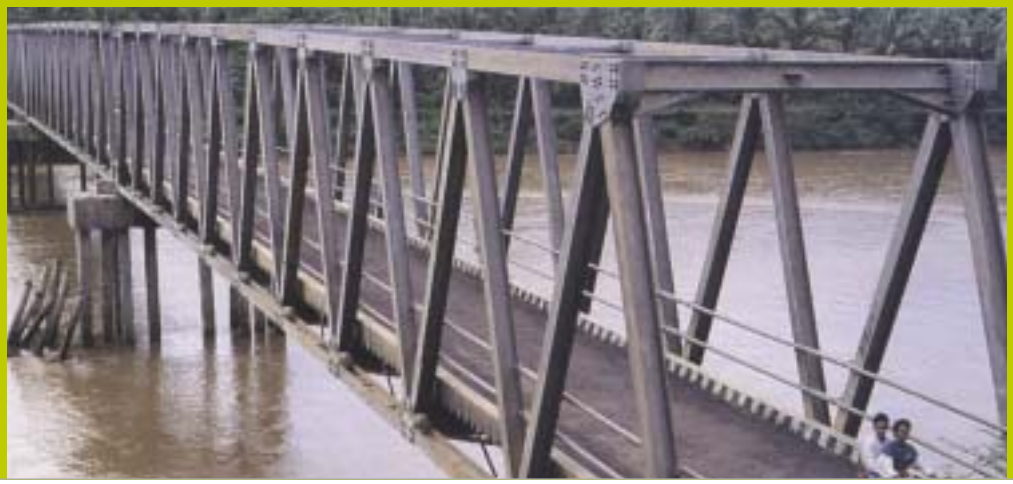
Authority: Taiwan Provincial Housing and Urban Department Bureau

Designer: China Engineering Consulting Inc

Construction: RET-SER Engineering Agency and Evergreen Heavy Industrial Corp.



The Ngon Bridge – Laos



Single-Lane Permanent Span C-Class Truss, multi-span

Indonesia - Cambodia Malaysia - Myanmar - Laos

Transfield-MBK Steel Bridging Systems

Organisation

An outstanding infrastructure bridge achievement throughout the region was the introduction in 1980 of the Transfield prefabricated bridge systems.

Transfield Constructions were the provider of the Transfield MBK bridging system throughout the South East Asia region. This included Transfield's Joint Venture Company in Indonesia, P.T. Trans-Bakrie.

Clients included Government contracts, local authorities and private companies. In flow-on contracts, Transfield-MBK designed and supplied steelwork for a 235 metre double lane suspension bridge over the Mamberamo River in Irian Jaya and a Twin Suspension Bridge over the Barito River in South Kalimantan (each 420.5 metres in length with a 60 metre deck top truss bridge at the Banjarmasin End).

The original series of these bridges were fabricated and galvanized at Transfield Galvanizing - Seven Hills Plant Sydney, but were progressively manufactured by the developing fabrication and galvanizing industry in Asia.

Double-Lane Permanent Span A-Class Truss

Standard Truss Bridging

Standard Girder Bridging

Transpanel Single-Lane

Design

Designers of the systems were consulting engineers, Cardno MBK (formerly McMillan Britton Kell Pty Ltd) of Sydney, a firm with more than 50 years experience in bridge projects.

These bridges were designed for simple and rapid erection by untrained labour using only basic equipment augmented by special components incorporated as part of the system.

No falsework or intermediate supports were needed for construction.

The six bridging systems available cover span lengths from 10 to 120 metres.

Three of the systems provided permanent bridges while three were for semi-permanent or temporary purposes. Design complies with the AASHTO and Austroads Standards.

Key transport linkages were achieved at a wide range of remote coastal and inland waterway locations where a steel protective system was required with wide suitability for the many service exposures involved.

Some 3500 spans covering all six bridges systems have been installed since their inception.

All components were after-fabrication galvanized for maximum corrosion protection and complement this particular design use of steel.

Long Span Truss Bridging

Singapore

Bukit Timah Pedestrian Road Bridge

This bridge is estimated at 56 metres in length and 2.2 metres wide and is composed of 33 tonnes of steel. After-fabrication galvanizing steel protection was chosen to provide a superior finish and to prolong the life span of the steel. Ability to withstand the hard wear of constant pedestrian traffic was important and a duplex colour topcoat was applied over the galvanizing to provide an aesthetically pleasing architectural finish.

JLN Bukit Timah Pedestrian Bridge

Update

As an update to these case histories we can report further bridge announcements in South East Asia.

Twelve Provinces Bridge Replacement Project

The Indonesian Ministry of Settlement and Regional Infrastructure has just awarded the "Twelve Provinces Bridge Replacement Project" to the Trans Bakrie-DSD Joint Operation. This contract comprises the supply of 73 bridge spans which will be erected in 12 separate provinces of Sumatra and Java.

Trans Bakrie won this tender with a modified design, by Cardno MBK, to the AASHTO LRFD Bridge Code. The proven principles of the Transfield-MBK bridging system remained unchanged.

Trans Bakrie's partner is DSD Dillinger Stahlbau, an established German contracting company that is part of the MAN and Ferrostahl Groups.

Eastern Indonesia Region Transport Project – Procurement of Steel Bridging

Trans Bakrie has just received formal award of the IBRD (World Bank) funded steel bridge supply contract from the Ministry of Settlement and Regional Infrastructure.

This important project named the "Eastern Indonesia Region Transport Project – Procurement of Steel Bridging" is for the design, fabrication and supply of 77 spans of bridging ranging from 40m to 100m in length. Total weight of supply is 9150 tonnes and these bridges are all destined to be erected in Eastern Indonesia over a large geographic area from Central Kalimantan to Irian Jaya.

The same Cardno MBK design will be used and all fabrication and galvanizing will be carried out at Trans Bakrie's Sumuranja facility. Completion date is January 2003.

GAA records its thanks for the history and data in this issue to
Richard Woods – Cardno MBK Consulting Engineers, Sydney, NSW
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George Walker – P.T.Trans Bakrie – Indonesia
Pasminco Metals
Galvanizing Association of Taiwan (ROC) and many GAA International Associate Members in Asia

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