



Corrosion protection of steel bridges

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CONTENT

- ISO 12944
- Coating system selector
- Life cycle calculations
- Experience



Corrosion categories

Table 1. Corrosion category	Examples of environments	
	Exterior	Interior
C3 - medium	Urban and industrial atmospheres, moderate sulphur dioxide pollution. Coastal areas with low salinity.	Production rooms with high humidity and some air pollution e.g. food processing plants, laundries, breweries and dairies.
C4 – High	Industrial areas and coastal areas with moderate salinity.	Chemical plants, swimming pools, coastal ship and boatyards.
C5-I – Very high industrial	Industrial areas with high humidity and aggressive atmosphere.	Buildings and areas with almost permanent condensation and with high pollution.
C5-M – Very high marine	Coastal and offshore areas with high salinity.	Buildings and areas with almost permanent condensation and with high pollution.

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Table 2

Table 2													
Surface prep.		Primers				Topcoats			Paint system		Expected durability		
St2	Sa2 ½	Binder	Type	No. coats	NDFT micron	Binder	No. Coats	NDFT micron	No. Coats	NDFT micron	Low	Medium	High
	x	CR	Misc.	1-2	80	AY,CR, PVC	2	120	3 - 4	200			
	x	EP,PUR		2	120		1 - 2	80	3 - 4	200			
	x			EP,PUR	1	80	EP,PUR	3	200	4	280		
	x	EP,PUR			1-2	80		3-4	240	4-6	320		
	x		EP,PUR	Zn(R)	1	40	EP,PUR	2	120	3	160		
	x	1			40	3		200	4	240			
	x	ESI	1		80	AY,CR,PVC	3	200	4	280			
	x		1		80	EP,PUR	2-4	240	3-5	320			
	x		1	80	2-4		160	3-5	240				
	x		1	80	3	200	4	280					
	x		1	80	AY,CR,PVC	4	240	5	320				



Bridge coating selector

- The bridge coating selector is a simple flash file, that will display coating systems that are in accordance with the ISO 12944 guidelines.
- All systems are designed for an expected lifetime of more than 15 years before major maintenance is required.





Life cycle calculator

- The life cycle calculator calculates the cost of corrosion protection per sqm per year for various paint systems .
- It also calculates the lifecycle cost for the paint system all of course under a number of assumptions.





Humen Bridge

The Humen Pearl River Bridge is a suspension bridge over the pearl river in Dongguan, Guangdong, China.

Completed in 1997. Main span is 888 meters.

The bridge is 3,618 meters long with 5 sections.

Geological conditions relatively good with bedrock overlaid with thin soil layers. Hurricanes are common so the design wind speed was established at 61 m/s.

Paint specification (exterior of the box girders):

Zinc silicate shopprimer	15 micron
Zinc silicate primer	75 micron
Sealer	25 micron
Epoxy MIO midcoat	80 micron
Polyurethane topcoat	80 micron

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Under construction



10 years later



10 years condition interior



10 years condition exterior

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Jiangyin Bridge

Jiangyin suspension bridge is the most seaward bridge to cross the Yangtze River of China. The main span of the bridge is 1,385 meters making it the fifth largest bridge in the world at the time of construction. The concrete towers are 190 meters. The main span is made from flat streamlined steel box girders. It was constructed by raising preassembled units weighing up to 500 tons with jacks.

Paint specification (exterior of the box girders):

Zinc silicate shopprimer	15 micron
Zinc silicate primer	80 micron
Sealer	25 micron
Epoxy MIO midcoat	80 micron
Polyurethane topcoat	80 micron

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After opening



After opening



Inspection after 8 years



After opening

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Runyang Bridge



Runyang Bridge consist of two bridges, a South Bridge and a North Bridge over the Yangtze river through a small island (Siyezhou) in the centre of the river downstream of Nanjing. The South bridge is a suspension bridge with a main span of 1,490 meters and the Northbridge is a cable stayed bridge with a main span of 406 meters.

Both the bridges are steel box girder constructions with 6 lanes highway.

Paint specification (exterior of the box girders):

Zinc silicate shopprimer	15 micron
Zinc silicate primer	75 micron
Sealer	25 micron
Epoxy MIO midcoat	100 micron
Polyurethane topcoat	80 micron

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View from cable



Section in yard



Quality control



Quality control

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Sutong Bridge

Sutong Bridge is the longest cable stayed span in the world. It lies between Nantong City and Changshu in the eastern part of Jiangsu province in China. The total length of the crossing is 8206 meters and the central span is 1,088 meters and a height of 62 meters allowing 4th and 5th generation containerships to pass through in all weather.

The area has 30 days of heavy fog, more than 120 days of heavy rain, typhoon and frequent tornados with high wind speeds.

Paint specification (exterior of the box girders):

Zinc silicate primer	75 micron
Sealer	25 micron
Epoxy MIO midcoat	140 micron
Polyurethane topcoat	80 micron

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During construction



Assembly of sections



Quality control of coatings



Quality control of coatings

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Conclusion

- Corrosion protection of steel bridges can be extended by selecting the paint system based on corrosion category, expected lifetime and an intelligent choice of paint system.
- Practical experience over a number of years show that the expected lifetime of 25 – 30 years are obtainable.



Some new construction references in Hungary

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Pentele-bridge

Presently this is the longest bridge (1682 meter) in Hungary over the river Danube between Dunaújváros and Dunavecse. This is part of the new highway called M8. It was built between 2005-2007.

Paint specification (Standard):

Reacor 2K EP 50 ZN	80 micron
Reacor 2K EP 57 EG	80 micron
Megatop 2K PUR DB687.71	80 micron

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Ready to use

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Megyeri-bridge

This is one of the newest bridge in Hungary. Part of the M0 ring-road of Budapest. This is the North Danube bridge of the highway. Exactly this project contains 5 bridges with the totally 1862 meter length. Of course part of the project the first cross cable bridge section in Hungary.

Paint specification (standard):

Reacor 2K EP 50 ZN	80 micron
Reacor 2K EP 57 EG	80 micron
Megatop 2K PUR DB687.71	80 micron

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During construction

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North Connective Railway- bridge

This bridge is under construction now. The project contains 3 bridges where 2 refurbishments and over the river Danube a new construction steel bridge. This is the biggest steel Railway bridge in Hungary with more than 600 meter length.

Paint specification (Standard):

HEMPADUR ZINC 87260	80 micron
HEMPATHANE TOPCOAT 87480	80 micron
HEMPATHANE TOPCOAT 87481	80 micron

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Under construction

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Pedestrian Flyover at Szemeretelep

This flyover was constructed in 2007. It helps to reach Ferihegy 1 airport by train. It gives safety pedestrian transport over the airport main road.

Paint specification (Standard):

HEMPADUR ZINC 17360	90 micron
HEMPADUR 15570	90 micron
HEMPATHANE TOPCOAT 55210	60 micron

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Total view

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Thank you for your attention!

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