INSTITUTE OF CORROSION
CORROSION ENGINEERING DIVISION

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STEEL BRIDGE PAINTING –
ACHIEVING THE OPTIMUM,
LONG LIFE PERFORMANCE

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Introduction – the Authors

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Introduction – SPC - the Company

- **SPC**, is a private, completely independent company specialising in coatings advice for both iron and steel structures.

- First major consultancy – London’s Thames Barrier in the 1970’s.

- Surveys and repainting advice on bridges including:
  - Forth Road & Rail, Tower Bridge Centenary, River Severn, QEII, Tamar and over 100 bridges and viaducts in India and Nepal and over 250 UK bridges

- Regrettably, numerous coating failure Investigations; (but clearly, not on any contracts that SPC have advised on!!)
  - Eurostar Bridge, Liskeard Viaduct and many A19 road bridges.

- SPC Consultants have been providing courses for engineers and Bridge owners around the world and their experience has been converted into a readable textbook. “STEELWORK CORROSION CONTROL”
Introduction

- This presentation aims to discuss the changes in protective coating technology for the structural members of steel bridges.

- It was first presented to the The World International Bridge Operators Conference in Edinburgh in 2013.

- It will review coating performance, the effect of specifications, surveys, maintenance regimes and their effect on durability as well as whole life costing.

- Three major UK steel bridges will be described.
Introduction

“It’s, - Just like painting the Forth bridge”.
Now, this age-old, Myth is history
Other considerations

- Future maintenance and access
- Road de-icing salts
- Ancillary items e.g. cables, bearings, crash barriers, parapets and lighting columns etc.
Changes – surface preparation

Flame cleaning

Modern automated abrasive blast cleaning at works and wet abrasive and high pressure water jetting on site.
Changes – paint coatings

Hand mixed paints

Two pack chemical curing
Metallic Coatings

Thermal metal spray

Used from the 1970’s with sealers
Originally hydrophilic.
Changed to hydrophobic (c 1980’s).
Fixed volume/fixed surface area.

Not to be confused with ‘cold galvanizing’. Discontinued after incorrect assessment of condition (c1980’s)
Metallic Coatings – thermal metal spray

Inadequate sealing along bottom edges
Metallic Coatings – hot dip galvanizing

Stainsby Hall Bridge
Teeside Parkway.
A four span, steel supported, concrete decked bridge
Erected in 1974
No maintenance.
SPC inspected during the PI in 1998 & 2005.
Specification Changes

"3 coats of paint, one of which should be a primer applied to a properly prepared surface"

What should be included
• Scope of the work
• Details of the structure
• The corrosivity of the environment
• Methods of access
• Surface preparation methods
• Coatings (paints – HA/NR Item Nos)
• Methods of application
• Handling and transportation of steel
• Application inspection and QC/QA
Specification Changes

Coating Applicator Training icats

Basic modules;
1. Health and Safety
2. Access, plant and equipment
3. Surface preparation
4. Paint types
5. Paint application
6. Quality control

ICATS now mandated by
Specification Changes

Qualified Inspection

- Inspectors should be qualified - the Institute of Corrosion scheme NACE/FROSIO etc..
- Levels I, II, or III depending on the size and importance of the contract
- They must be experienced with the type of coating being used and have practical experience.
- They must know and understand the specification.
- Experienced and understand the range of instruments.

Painting Inspector Scheme
Specification Changes

Standards

Surface cleanliness
ISO 8501-1

Surface profile
ISO 8503

Dust ISO 8502-3

Weldments etc.
ISO 8501-3

Soluble salts
ISO 8502 various

Sa 2½
Paintwork surveys

Maintenance painting is far more difficult than painting new steelwork

The potential life of high performance maintenance coatings is very rarely achieved
Paintwork surveys

It is essential to determine the condition of the existing paint before specifying and applying a new more highly stressed overcoating that will not perform on an unsound base or will not provide the optimum life to next major maintenance.
There are six main factors to be established before commencing maintenance painting

- Existing paint properties
- Metal coating condition
- Steel condition
- Extent of remedial work
- New coating system
- Repainting specification
Paintwork surveys

The paintwork condition survey

- Who carries out the survey
- Selection of areas
- Choice of site tests
- Removal of paint flakes
- Methods of access
Paintwork surveys

The paint surveyor

- Qualified and experienced Paint Technologist trained in examining and assessing weathered coatings.
- Detailed knowledge of paint formulations as well as the degradation of the properties of raw materials.
- Surface preparation methodology and methods of paint application should also be clearly understood.
Paintwork surveys

A selection of 14 important defects

- Adhesion
- Blooming
- Blistering
- Bacterial
- Chalking
- Cohesion
- Curing
- Cracking
- Dry spray
- Pin-holing
- Pinpoint rust
- Skin curing
- Thickness
- Under-rusting
Paintwork surveys – site tests

- Cross hatch
- Abrasion
- Solvent
- Cross cut
- PIG
Paintwork surveys

Feasibility trials

- Pre-specification survey
- Draft specification
- Feasibility trials
- Final specification
- Painting contract
Paintwork surveys - summary

- Painted steel – identify paint condition, establish optimum repainting timing and methodology.

- Thermally sprayed steel – remove metal coating when protection no longer exists and apply paint.

- Galvanized steel – leave until passive zinc/iron alloy layer appears, prepare and repaint.
The Forth Road Bridge

Opened 1964
Zinc thermal metal spray,
hydrophilic metal sealer
Zinc chromate primer,
Tung oil phenolic MIO & finish

First full repaint
after 42 years,
full coating survey
Detailed specification
The Forth Road Bridge – feasibility trials
The Forth Road Bridge – feasibility trials

- 8 Manufacturers selected
- 100 sq. m. for each coating
- All areas abrasive blast cleaned
- FRB staff applied coatings
- Highways Agency systems
- Non standard also included
The Forth Road Bridge

Abraded area of sound paint and SPC examined each system annually

Adhesion tests on over-painted existing system examined every year after 9 year trial.
The Tamar Bridge

The Queen Elizabeth II Bridge
M25 Dartford crossing

First coated in early 1990 with Chlorinated rubber multi coat system. Re-coating trials for small areas of breakdown.
Alternative Coating Systems

Solvent free-high build

Waterside bridge, Scotland, 1988, 1000µm elastomeric urethane
Whole Life Costing

The UK’s Steel Construction Institute (SCI) produced a report stating, that following a survey by SPC of over 1,500 steel bridges that: “Major maintenance intervals based upon previously short predicted times (12-15 years) were at variance to the actual performance and the latter should now be considered in whole life costing terms to be extended to at least 25 years”.

SPC Recommendations included:-

• The use of modern long life coatings for new works should be considered to extend maintenance painting intervals to 30 years.

• Proper and very careful painting surveys should be carried out by qualified coating professionals.

• Improved coating inspection during all re-coating contracts.

• Then only 4 interventions instead of 8 during 120 year life halving the whole life costs of all bridge structures.
Conclusions

To maximise life to first or next maintenance requires;

A detailed technical survey by qualified coating specialists
A meaningful specification based on the survey and trials
Qualified and experienced operatives for maintenance
Qualified coating inspectors and detailed records
Thank you for listening.

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