



SURVEY REPORT

Report ref.	REV
2015.01#02	3

THE STEEL PROTECTION CONSULTANCY LTD

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Technical Report

Manchester Central Convention Complex-Gable Ends Coating Condition Survey

13/01/2015

1. Introduction

Following initial discussions with Mr Mark Matthews of Taziker Industrial Ltd (TIL) and Wil Deacon of the Steel Protection Consultancy Ltd (SPC) a survey of the existing coatings present on the gable ends of Manchester Central Convention Complex was requested.

The survey was arranged for 13th January 2015 and would be undertaken by Wil Deacon (SPC) a Level III Institute of Corrosion coating inspector, Mr Matthews (TIL) would also be present during the survey.

2. Inspection

The survey was able to be carried out from fixed walkway gantries at various levels within the Gable ends and this allowed a detailed inspection of the majority of the coated surfaces.

The front Gable end had two walkway levels with clock housing present and the rear Gable had three access levels as here there was an additional lower level of framework, which included ornate detail at either side of the main frame. The weather during the survey ranged from sunny and dry in the morning to wet and windy in the afternoon, ambient temperatures did not rise above 5°C throughout the day.

A series of micro-destructive and non-destructive testing was undertaken on all sections of the structure along with a detailed, careful visual examination, these tests included:

- (i) Non-destructive coating film thickness tests (DFT), using a PosiTector 6000 electro-magnetic gauge
- (ii) Visual examination where necessary with the use of a convex extending, angled mirror and penlight beam.
- (iii) Micro destructive adhesion tests (St Andrews Cross).
- (iv) Micro destructive abrasion tests to identify the number of coats.
- (v) Examination, by various magnifications of the condition of the coating of the outer surface and on the micro-destructive test areas above.
- (vi) Swab testing with various solvents to establish, binder generic type.
- (vii) Swab testing qualitatively, to identify toxic lead pigments present.

- (viii) Removal of small samples, for further laboratory examination (**See Appendix 1**).
- (ix) Close-up photographs of specific features.

2 (i). Inspection of Front End Gable

This was the first area to be examined and comprised of a main arch beam with diagonal lattice infills, horizontal and vertical angle sections with flat section diagonal bracings throughout.

The majority of the sections were fixed by rivets, although a number of bracings were bolted (**See Fig. 1**), these bolted sections, which were mainly on horizontal cross bracings, were newer than the original structure and had been installed, possibly to strengthen the structure, between the outer and inner Gable frames.



Fig. 1

Visually the condition of the existing coatings appeared generally sound with only minor areas of corrosion and coating breakdown noted. The areas of corrosion were isolated and found to be mainly along the horizontal angle sections (**See Fig. 2**) and where coatings had been removed by mechanical damage exposing the substrate beneath (**See Fig. 3**).

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Fig. 2



Fig. 3

The areas of coating breakdown were however fairly widespread and these included surface cracking of the coatings (**See Fig. 4**) and also extensive flaking and delamination of the white top coat (**See Fig. 5**).

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Fig. 4



Fig. 5

Micro-destructive testing was carried out to identify the number of coats present and this was

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found to vary between the original and newer sections. The original sections were found to have a total of 24 coats of paint of varying thicknesses and generic type (**See Fig. 6**) and when spot tested for the presence of lead there was a reaction indicating there may be toxic materials within the existing system.

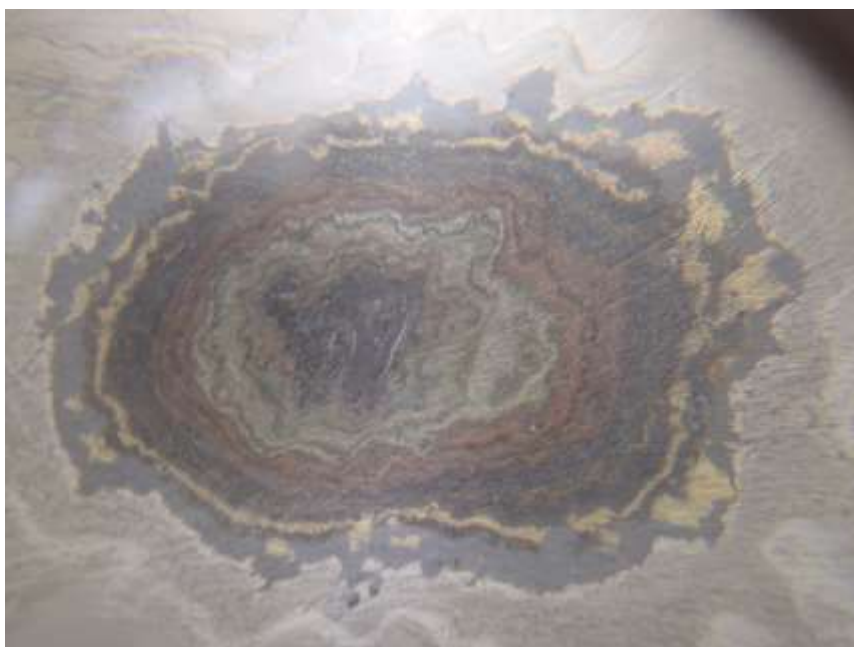


Fig. 6

The failing topcoat was found to be an alkyd type material which had been applied over an epoxy type coating that had not been adequately prepared prior to over coating which in turn had appeared to contribute to the delamination witnessed.

Adhesion of the coatings on the original areas was tested using the St Andrews cross cut method and this identified an embrittlement of the existing system which was affecting the overall adhesion to the substrate. This testing also highlighted the top coat adhesion weakness even where the top coat appeared visibly sound it still showed signs of poor intercoat adhesion (**See Fig. 7**).

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Fig. 7

The coating system on the newer sections was found to be an epoxy system, with the exception of the alkyd type top coat which, again was poorly adhered to the underlying paint layer, however the overall adhesion of the remaining epoxy system had fair to good adhesion (**See Fig. 8**). Micro destructive testing identified six layers of paint in total.



Fig. 8

Minor corrosion and coating breakdown was noted within the channel section of the outer main arch, although this was not severe it was clear that moisture and debris was collecting here and accelerating the coating deterioration (**See Fig. 9**).



Fig. 9

2 (ii). Inspection of Rear End Gable

This was the second area to be examined and was subject to the same testing regime as the front Gable end. This was of a similar design as the previous section with the addition of a lower level of framework and ornate detail at either side of the main arch.

Visually the condition of the existing coatings was found to be fair with minor areas of corrosion and coating breakdown present. There was however noticeable flaking and delamination of the grey top coat (**See Fig. 10**), which had also discoloured in a number of areas.

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Fig. 10

Corrosion was more widespread than that found on the Front Gable end and this was located in numerous areas including under the walkway grating (**See Fig. 11**).



Fig. 11

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Micro destructive testing found that there were two coating systems present the first was on the newer angled bracing and this comprised of seven layers of paint which were again similar to that found on the front Gable newer sections.

Solvent swab testing found the system to be an epoxy type material with the exception of the delaminating top coat which appeared to be an alkyd type coating. St Andrews cross cut tests revealed that the adhesion of the coating system on these newer sections ranged from fair to good (**See Fig. 12**).



Fig. 12

The original sections appeared to have undergone full removal at some point in the past as here micro destructive testing identified a six to seven coat system which was found to be an alkyd type with a grey top coat. The adhesion of this system was good overall with only a slight intercoat weakness between the build and top coat layers where visibly sound (**See Fig. 13**).

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Fig. 13

It was also noted that a number of the “back to back” gaps had been filled with and this had created a moisture trap and rust staining was visible in these areas (**See Fig. 14**), where the gaps had been left open no corrosion had occurred.



Fig. 14

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A number of gaps on the Gable end had also been filled/sealed with a fillet of mastic (**See Fig. 15**) which appeared to have performed well as no corrosion was visible from these jointed areas. However in some locations a foam filler had been used and this was now brittle and friable.



Fig. 15

The only real area of concern was noted in some isolated patches and this was where it was thought that the original coating system had not been fully removed (**See Fig. 16**) and here it is possible that lead based coatings may still be present as a slight reaction was detected when spot testing for toxic pigment was carried out.

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Fig. 16

The ornate configuration also appeared to be in good condition with very little breakdown, but where there were plies between the main arch and ornate structure there was clear rust staining present (**See Fig. 17**).



Fig. 17



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3. Conclusions & Recommendations

It is clear from the site survey that the general corrosion protection provided by the existing coating system is good, with the exception of the noted items where corrosion is present, although not considered severe.

There is a major intercoat failure of the top coats present on both ends of the structure although this does not appear to have any detrimental effect to the overall protection and is considered an aesthetic problem rather than a corrosion issue.

Where the walkway grills have been installed a rubber type matting has been used to stop direct contact with the coated framework beneath and this has prevented damage occurring.

The design of the original structure has created numerous “back to back” areas and the majority of these have very little breakdown or corrosion present.

It should also be noted that any coating preparation work must be in accordance with the Lead at Work Regulations due to the presence of lead based coatings across the structure (**See Appendix 1**).

There are a number of options going forward that can be adopted which would give varying life to first maintenance and these are:

Option 1

Do nothing and allow the existing coating system to continue deteriorating, although areas of corrosion will become far more widespread and could affect future surface preparation standards which will reduce the performance of any future protective systems applied.

Option 2

Patch prepare areas of corrosion by mechanical power tool methods to an St3 standard and locally patch paint. This would protect the exposed substrate for 5-7 years before visible breakdown becomes apparent.

Option 3

Fully remove the poorly adherent top coats by either high pressure jet washing or mechanical methods or a mix of both, power tool prepare areas of exposed substrate to an St3 standard and patch prime, this would then be followed by a full over coat to all cleaned, prepared and primed areas.



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It is estimated that this would extend the life of the existing coatings by a further 8-10 years, but the prepared patches would still start deteriorating after 5-7 years. For this over coating option it is recommended that a feasibility trial is undertaken to ensure the optimum coating system is adopted and that any stressed placed on the existing coating system does not have an adverse effect where adhesion has been reduced due to the embrittlement of the aged coatings.

Option 4

The final option would be to fully remove all coatings by abrasive blast cleaning to an Sa2½ standard and apply a full coating system to all areas. It is recommended that if this option is adopted then a similar system as that of the Highways Agency approved materials could be used which have a proven track record and also would be finished in a re-coatable polyurethane material which is maintenance friendly and would aid any future maintenance touch up or overcoating. It is estimated that if this option was used then a life to first major maintenance of 20-25 years could be achieved.

Wil Deacon
SPC
(30/01/2015)



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APPENDIX 1



Certificate of Analysis

SPC Ltd
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Leighton Buzzard
LU7 6BX

Certificate Number: 5500/15

Date: 26 January 2015

Manchester Central 13-1-15

Sample	Hexavalent Chromium	Lead
Front Gable Aged Coatings	ND	15.6%
Front Gable Newer System	ND	0.3%
Rear Gable Aged Coatings	ND	0.02%
Rear Gable Newer System	ND	15.6%

Brenda Peters MICorr. FTSC. FIMF