F·T·M·R·C

Commissioned Independent, Site inspection, Technical assessment & Report

on the

Copper Dome installed on the roof of
Koko Building
1A Camden High Street,
London NW1 7JE

Inspection, Assessment and Report
Carried out and produced
by

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1. Introduction

This independent report and a site inspection were commissioned by Full Metal Jacket Ltd (FMJ) through the office of the Federation of Traditional Metal Roofing Contractors (FTMRC) who instructed the writer to arrange to carry out a site inspection. The writer contacted Mr Terry Smith FMJ, contract surveyor, to arrange for safe site access to carry out the site inspection.

For clarity and ease of identification, reference may be made to the photographs numbered & highlighted in red included with this report.

2. Brief history of the building

The Koko building was originally named the Camden Theatre. It was designed by WGR Sprague and opened on Boxing day 1900. Over the past 118 years, the building has been used as a theatre, music hall, radio broadcast centre and concert venue and more recently as a nightclub music venue. The writer understands that the building has Grade 2 Heritage listed status. From sketches seen of the original building, the Copper dome was topped by a secondary domed finial.

3. Site Inspection & Observational notes

The site inspection took place on Monday 18th March 2019. The writer was met on site by Mr Smith FMJ who explained his company's current role in the restoration of the copper work on this project. Currently, Archer Humphreys Architects have issued drawings suggesting that repairs could be carried out to the domes copper weathering details. Having carried his own inspection of the Copperwork, Mr Smith concluded in his report that the copper dome has reached the end of its useful life and is beyond repair. Following the inspection, the writer received a copy of this report and several architect's drawing for reference.

External scaffolding was being erected around the face of the building and dome on the day of the inspection. The writer and Mr Smith were permitted under escort, to inspect the upper areas of the dome from the part installed scaffold.

3.1 The base areas of the dome were inspected first from the flat roofs. The original copper work has been installed with a horizontal cross welt (joint terminology) single lock joints. The panels are vertically secured (welted) into an ornament hip detail. The hip weathering copper capping are part secured with brass wood screws. It is not possible to determine whether this was original detailing or part of a latter repair programme.

3.2 The writer noted that the poor condition and lack of fixing within some of the lower copper panels at the base of the dome. There were severe panting and distortions, within these panel faces between the battens.

3.3 The writer noted that some of the panels were loose and flappy on cross joints. The repairs and the external nail fixing saw on the lower panelling was very poor. The would have certainly restricted thermal movement within the surface causing fracturing and distortions in the copper surface. The long-term effects would a breakdown in the metals weathering ability allowing water ingress.

3.4 The use of flash band and bituthene paint used as a weathering at the base presumably to whether the copper and felt roof covering should only be considered as a temporary short-term weathering solution.

Photo A

Photo B

3.5 Some of the hip detailing were showing signs of distress with brass screw fixing missing. Photos C, D & E. The writer's opinion is that the wooden substrate and hip carcass has degenerated over time probably due water ingress behind the metal weathering. The sealing (3.4) has only added to the issues by locking any ingress with lower sections of the dome.

Photo C

Photo D

Photo E

Photo F

3.6 It was noted that the size of the panels in the lower sections would exceed current trade good practice recommendations. Photo F.

Following the inspection of the base areas of the dome, we continued the inspection of the upper weathering details from the scaffold.

3.7 The writer noted that several joints had fractured and were now failing. There could be several reasons or an accumulation of reasons for this within the installation. Photos G, H, I & L. Photos K & L show early signs fatigue with the welted joint detailing.

(a) The gradual thinning of the copper over the installation period.
(b) Thermal expansion and contraction.
(c) Metal-induced embrittlement, causing a loss of ductility in the metal, making it brittle.
(d) Failure of the metal fixing.
(e) Failing and ageing of the substructure below the metal.

Photo G

Photo H

Photo I

Photo J

Photo K

Photo L

3.8 Latten damage and further flash band repairs on the upper areas of the dome. Photos M & N

Photo M

Photo N

3.9 Photo O shows the nails in one of the upper panels and Photo P is from the lower panel cross joint. The writer believes that this is a poor repair for fixing back the joint where the actual original fixing had failed.

Photo O

Photo P

Photo Q

Photo R

3.10 Photographs Q & R is of the weathering on top of the dome where bituthene paint felt repairs have been at some point in the past. The copper has been installed with the standing seam detail on what appears very flat area with very little pitch. This has resulted in the water ponding on the surface. A standing seam installed on such a low pitch is very susceptible to water ingress syphoning through the seam upstands. It is the writer's opinion that the standing water within the cover would be a major concern as ingress may distorting the copper supporting decking. Photos Q & R

* A cautionary note from the writer's experience, care must be taken if further investigation is required on the flat area, the surface distortions suggest that the flat substrate may not be capable of supporting heavy weights.

3.11 The is final photograph below shows of a rung on one of the iron ladders. The picture shows the rust and decay that the ladder and dome have been exposed to since 1900. Photo S

Photo S

4. Technical Assessment & Conclusions

In carrying out this inspection, the writer was mindful that this building has Grade 2 listed status. It is a very fine example of late Victorian architecture, both internally and externally. The architectural detailing used to install the copper with the rolled detail is excellent; it shows off the old craftsmen's high level of skills. However, the dome has been exposed to 118 years of weather including winds, both negative and positive, pulling at the metal surface and its fixing. This as much as the rain and environmental changes have taken its toll on the copper weathering of the dome. Any failing within surface weathering over time affects the substructure below the metal surface. To what extent at present it is not known. It should be assumed, however, with some of the failing seen during the inspection, along with the past repairs programmes which in some parts were poorly thought out and executed with have conciseness.

The writer has looked at the latest technical and scientific information which suggest that the structure of exposed copper will break down over time. We now know from experience that it does suffer metal thickness and metabolism changes. These usually start to occur in a well-installed copper weathering after 60- 70 plus years. Depending on location and environment copper manufacturers suggest a weathering live span of one hundred years.

The thinning and metabolism changes as highlighted in Paragraph 3.7 item (c) metal - induced embrittlement makes the possibility of stripping out of traditionally installed old copper sheets and reinstalling of new material using the same detail in the same position impossible with aged metal. The metal fractures can are seen in photos G & H. It may be possible to carry out limited soldering or brazing repair to small areas if the metal is still in good enough condition. These types of repairs are not always aesthetically pleasing and will probably not offer long term solutions.

The writer's conclusions, therefore, are that due to the age and condition of the copper weathering it is not repairable and will need to be stripped and replaced. Once the copper has been removed, to expose the copper's immediate timber support decking, it will allow further investigations to assess the condition of the domes supporting substructures more effectively.

The writer would suggest that the fixing detailing of the reinstalled copperwork will need to be considered. However, I am confident that new copper will be reinstalled to the same excellent aesthetic standard as the original installation.

I can confirm that I have made clear which facts and matters referred to in this report are within my knowledge and which are not. Those that are within my knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

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Technical Consultant
FTMRC

It was noted that there several areas where metal embrittlement had led to fixing joints fracturing. Recent scientific information suggests that there is a gradual loss of ductility, making metals brittle in older installed roof weathering. However, there are several other circumstances.