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STRUCTURAL INSPECTION REPORT

Blackpool Victoria Hospital, RAAC units

Abstract

This document details the findings of the inspection carried out in December 2019 with regard to the Reinforced Autoclaved Aerated Concrete (RAAC) roof units in various locations

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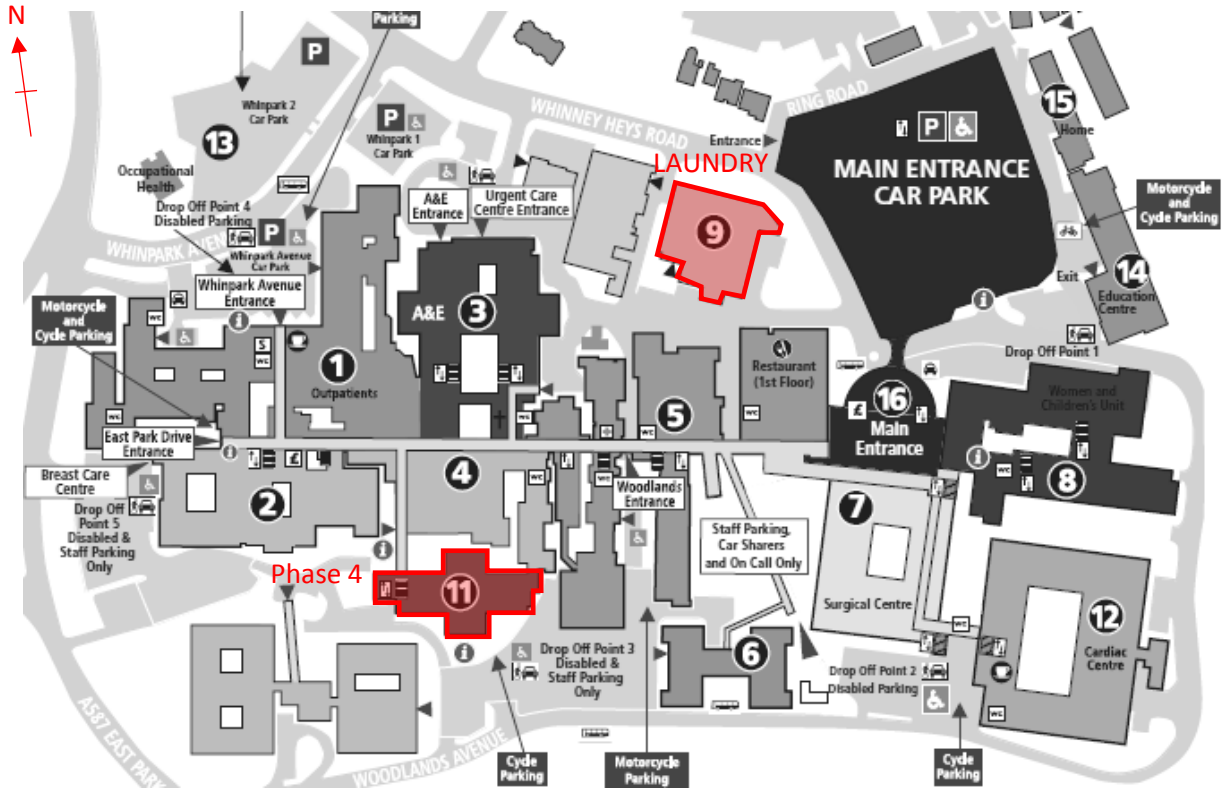
PREFACE

The Alan Johnston Partnership LLP have been appointed to undertake a structural review of all buildings within the hospital estate to identify the use of RAAC units in their construction. Following a discovery of such units in the laundry building and in phase 4, an inspection of the roof panels was undertaken. Based on historical maps, it is estimated that the laundry building was originally constructed circa 1970. Although the building use may have changed over time, it is currently used as a laundry processing/storage area for the hospital. The phase 4 wards were constructed during the 1980's and provide areas for patients and medical record storage.



BUILDING LOCATIONS WITHIN THE SITE

Both buildings have roofs constructed from Reinforced Autoclaved Aerated Concrete (RAAC), a construction which has been identified as problematic in certain circumstances and is subject to a checking instruction from the NHS. This report details the findings of the inspection carried out 10th December, and outlines various recommendations in managing the risks identified. A further inspection was undertaken on 7th January, the results of which are in the final section of this report.

REINFORCED AUTOCLAVED AERATED CONCRETE

Autoclaved aerated concrete is different from normal dense concrete. There are no coarse aggregates and the concrete is filled with chemically induced gas bubbles to reduce its weight. It is relatively weak and was used widely in the 1960's -1980's for roof construction. Many instances of sudden collapse have been attributed to RAAC, which has a useful lifespan estimated to be around 30 years.

In late 2019, the Local Government Association (LGA) drew attention to the potential structural issues surrounding RAAC roof planks and made recommendations relating to maintenance and inspection regimes. This was followed for a publication by the Standing Committee on Structural Safety (SCOSS) which highlights the findings of testing/case studies, refer to Appendix A.

The common causes of failure were identified by the report are as follows:

- Incorrect/insufficient cover to reinforcement
- Creep (continued deflection over time) due to a low stiffness
- Insufficient anchorage of reinforcement at support points
- Water ingress and the associated reinforcement corrosion, particularly at support points
- Failed waterproofing membranes
- Insufficient bearing at supports

STRUCTURAL ASSESSMENT METHOD

Inspections were undertaken during normal daytime operation hours with assistance from the hospital estates department, the weather was particularly rainy and typical for the time of year.

The inspection was visual, and allowed the general condition of the roof planks to be assessed collectively. The following signs of deterioration were checked for:

- Excessive deflection
- Signs of water ingress or rusting of reinforcement
- Cracking
- Spalling
- Discolouration/staining

The following criteria were also assessed:

- Condition of concrete in areas of high shear (at supports)
- Bearing width
- Evidence of roof resurfacing or levelling works
- Susceptibility of roof to unusual loading

LAUNDRY ROOF INSPECTION

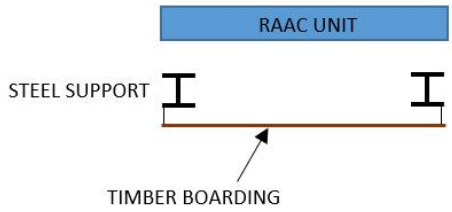
The roof of the laundry building has a saw-tooth ‘North light’ profile, with planks laid to falls as well as being laid flat. The planks span between an arrangement of steel beams. Timber boarding is suspended from the steelwork and partially conceals the roof structure. Assisted by a mobile scissor lift platform, AJP were able to access the underside of the roof and inspect a limited number of RAAC planks.

Although the timber panels were a hindrance to the inspection, the panels were sufficiently visible to allow several signs of deterioration to be identified as follows:

- Excessive deflection due to creep
- Discoloured and spalling concrete near to supports and roof cowl
- Broken concrete at edges and fixing locations

Refer to the images overleaf for further details.

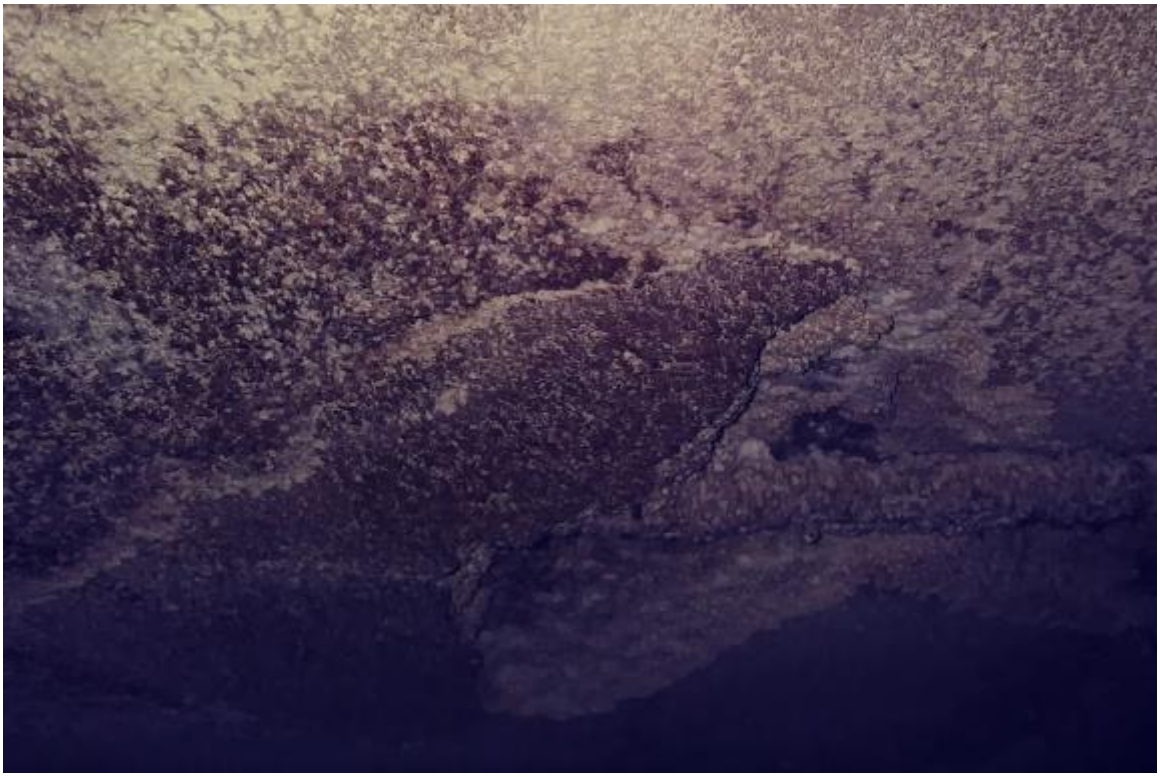
NORTH LIGHT ROOF PROFILE



GENERAL ARRANGEMENT OF FLAT ROOF AREAS

BROKEN CONCRETE AT FIXING LOCATION

SPALLING CONCRETE AT SUPPORT



SPALLING OF CONCRETE NEAR ROOF COWL

EXCESSIVE DEFLECTION

These findings suggest that many of the panels are nearing the end of their useful life, and deterioration is light/moderate. The extent of the deflection of the horizontal planks which form the valley gutters is concerning. It will be necessary to undertake a more detailed inspection following the removal of the timber panels which prevent a clear view of the RAAC units.

The units may will require full scale replacement with an alternative construction such as structural steel metal deck. Alternatively, it may be possible to prolong the building service life with the introduction of additional steelwork to reduce the current span of the planks by approximately 50%.

The most appropriate option can be further developed once a more detailed inspection has been completed.

Until further inspections have been undertaken, based on the low risk/occupancy of the building it is recommended that evacuation is considered in certain conditions. Due to the shape of the roof there is a risk of significant snow build up in the valleys during adverse weather. We would recommend that access to the building is restricted if there is a risk of significant snow fall which could lead to a build-up of snow in the valley gutter areas. Significant loading of the units could lead to collapse if their performance is compromised. There should be no access to the roof at any time until the planks have been replaced/resupported.

PHASE 4 INSPECTION

The roof in this area is pitched in all areas and finished with tiles. AJP were able to readily access the roof space and assess each RAAC unit without hindrance. The apparent signs of deterioration were very limited, none giving rise for concern. It is important to note that the tiled roof and associated waterproofing have failed in several key areas as follows:

- Head of main access stair
- Above the medical records store
- Above the disused mechanical plant to the West of the main access stair

It is recommended that these leaks are repaired as a matter of urgency to prevent water related damage.

INTERNAL ROOF SPACE IN PHASE 4

MATERIAL STAINING DUE TO ROOF LEAK

WATER INGRESS DUE TO ROOF LEAKING

WATER INGRESS AT HEAD OF PHASE 4 STAIR

SUMMARY OF RECOMMENDATIONS

Laundry store:

- Prohibit access to the roof
- Restrict building access if significant snowfall occurs
- Remove as much timber boarding restricting view of the RAAC units as possible
- Arrange a more detailed survey as soon as possible after the timber boarding has been removed

Phase 4:

- Urgently repair the leaks occurring in the areas described previously
- Repair/replace any water damaged material (namely timber/boarding)

ADDENDUM - ADDITIONAL INSPECTION OF LAUNDRY

Following the removal of the timber boarding as described previously, a further structural assessment was made. It was noted that 10 no. units featured openings for vents and had been fully trimmed out with steel beams. This trimming steel will act to support the units and is preventing the excessive deflection. No remedial works are required where these vents exist. All other panels are deflecting excessively and require a central support in the form of a steel frame to reduce their span. The steel frame will connect to the existing trusses and roof beams. Drawings which detail these works explicitly have been produced and provided separately to this report (Drg 219-390-S-001). It is

recommended that a further inspection is undertaken 1 year following completion of these works to ensure no further deterioration has occurred.