INSPECTION REPORT R217

ISSUE DATE:	15 December 2023	**CONFIDENTIALITY:**	Confidential
SUBJECT:	RAAC Discovery Inspection		
PROJECT:	NHS Scotland Assure RAAC Investigations	**AUTHOR:**	#011
CHECKED:	#003	**APPROVED:**	#002

SUMMARY DETAILS

NHS Board:	Forth Valley	
Site Code:	V105B	
Site Name:	Bo'ness Health Centre	
Block No.:	02	
Block Name:	Bo'ness Health Centre	
Inspection Date:	07/11/2023	
Structural Engineers	#011	
NHS Estates	Jamie Hill	
Summary Status	RAAC observed	Annual Inspection
Comments	Planks are generally in good condition, but to align with current guidance investigation of bearings is recommended.	

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INTRODUCTION

This report has been prepared to summarise the findings of a visual structural inspection carried out at the property described above. The purpose of the inspection was to establish whether Reinforced Autoclaved Aerated Concrete (RAAC) is present in representative locations and to make observations about the condition of RAAC in those locations. This report is not intended to be an appraisal of the whole structure, nor is it intended to report on structural matters unrelated to RAAC. Should those services be required by NHS Scotland Assure then a separate report should be commissioned.

The inspection was conducted from ground level externally and from floor level internally, except where ladders were used to view above suspended ceilings. It should be noted that ceilings tiles were taken down in a limited number of locations, because the building remained live and because the available asbestos information indicated that some locations were unsuitable for inspection. Nevertheless, in our opinion sufficient locations were inspected to decide whether RAAC was present or not.

Our report reflects the building and its condition at the time of inspection, however if RAAC becomes wet or is overloaded it will become distressed, and its capacity will reduce. For this reason, the building fabric, including the rainwater goods, must be regularly maintained and access to floors and roof structures should be managed.

The reader may not assume that locations not expressly described in this report are free from defects, damage, and distress. Nor can it be guaranteed that RAAC is not present in locations that were not viewed.

This report is for the exclusive use of NHS Scotland Assure and shall not be relied upon by third parties without the permission of WSP expressed in writing.

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INSPECTION LOCATIONS

The floor plan below shows locations where the roof structure was observed from either the underside of the roof where it was exposed, or within the ceiling void. Only areas positively identified as being free from asbestos were considered for inspection. In addition, several rooms were in use at the time of our visit and were therefore unavailable for inspection. That said, sufficient locations were viewed so that it is reasonable to assume that they are representative of the structure, and an accurate determination can be presented. We therefore do not foresee a need to view additional locations in the building for the purpose of RAAC Discovery.

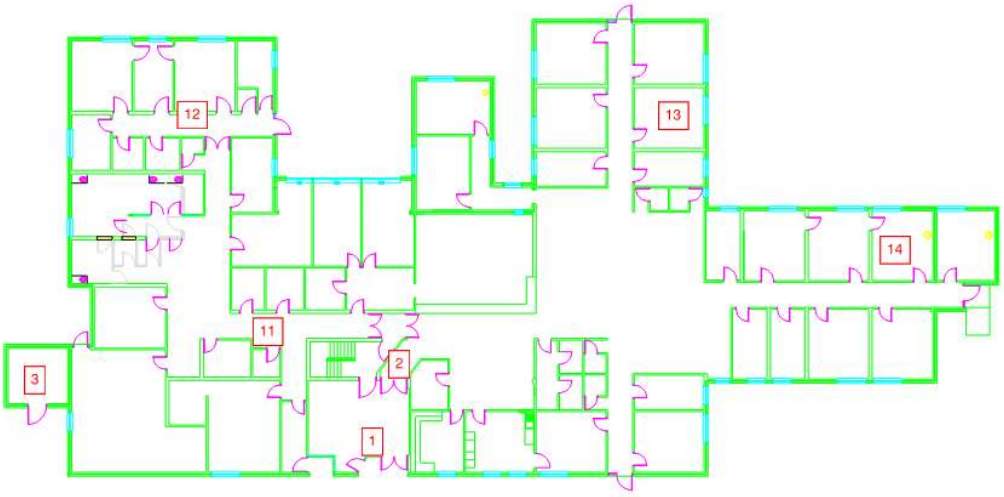

Figure 1 - Ground floor plan and inspection locations

Figure 2 - First floor plan and inspection locations

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OBSERVATIONS

The Bo'ness Health Centre is a partial two storey, brick cavity construction. It comprises a mix of both concrete and RAAC floor and roof structures supported by hot rolled steelwork and brickwork.

At the time of the inspection, it appeared as though the majority of the exposed plank surfaces had been recently painted.

The classification ratings presented in the table below are based on applying our observations to the '*panel condition matrix'* shown in the conclusions of this report.

The classification rating for bearings is not shown in the table below, although we have noted a requirement to investigate them. The reasons for this are discussed in detail within the conclusions. That said, the requirement to investigate the bearings is reflected in the overall category shown on the front sheet of this report.

The table below provides details of the observations that were made:

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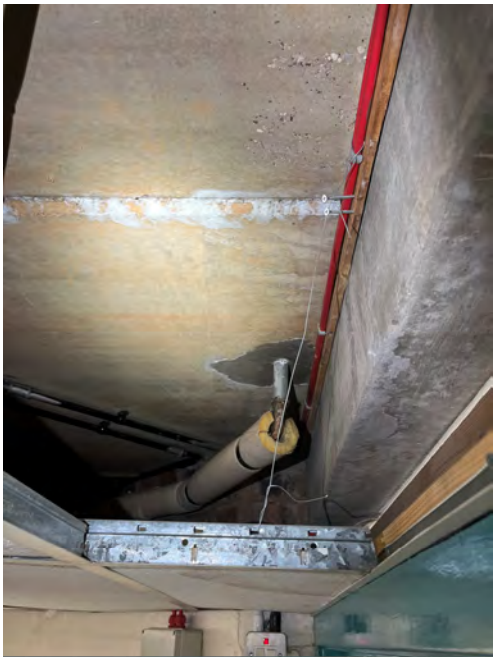
Location	Comments	Image
01	RAAC observed / Triennial Inspection The entrance area had RAAC planks exposed. These planks were generally in good condition with no evidence of water staining, distress or notable deflection. The planks spanned circa 5.6m from a down-stand over a steel angle section on the internal brick wall to a boxed down-stand at the external façade. The width of bearings and internal reinforcement at the support could not be measured.	
02	RAAC not observed / No action Within the building a concrete slab forms the first-floor structure.	

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Location	Comment	Image
03	RAAC observed / Annual Inspection The plantroom at the end of the building comprised brick masonry walls supporting a RAAC plank roof structure. Some discolouring was noted to the surface however this was believed to be related to installation. Some longitudinal cracks were noted within the plank junctions, but no cracks were noted within the planks themselves. There was no evidence of water ingress or staining. A service penetration was noted within the corner of the room, this had been trimmed with trimming steel typical for this type of construction, however it is not clear how some of the residual RAAC around the penetration is supported. This ought to be investigated further. The width of bearings and internal reinforcement at the support could not be measured.	
04	RAAC observed / Triennial Inspection Stairwell between the upper and lower floors had RAAC panels forming the roof structure. These spanned from the stairwell walls which were lined, but sounded solid when tapped. There was evidence of cracks between the planks but none to the planks themselves. There was no clear evidence of water ingress or notable deflection. The width of bearings and internal reinforcement at the support could not be measured.	

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Location	Comment	Image
05	RAAC not observed | No action A loft hatch on the first floor provided access to the roof projection which housed water tanks. This observation point revealed a timber roof structure spanning over lined walls. The floor slab was reinforced concrete.	
08 (representative of first floor roof structure, locations 06-09)	RAAC observed | Triennial Inspection RAAC planks were observed throughout the first floor. These generally spanned between boxed down-stand beams which are believed to be hot rolled steel sections based on observations elsewhere in the building. The boxing was circa 320mm deep by 280mm wide. Blockwork and brickwork walls extended to the underside of the planks, however it is believed the planks span between the perimeter walls and down-stands. Maximum span measured was 5.15m. The perimeter walls were lined, and the brickwork bonding could not be observed. No clear evidence of distress, water ingress or notable deflections were noted. The width of bearings and internal reinforcement at the support could not be measured.	

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Location	Comment	Image
10	RAAC observed / Triennial Inspection RAAC roof panels and the concrete floor slab of the water tank projection were visible from the staff room on the first floor. Both elements spanned between down-stand beams, maximum span was measured as 5.05m. No clear evidence of distress, water ingress or notable deflections were noted. The width of bearings and internal reinforcement at the support could not be measured.	
12 (representative of ground floor roof structure, locations 11-14)	RAAC observed / Triennial Inspection RAAC planks were observed throughout the ground floor ceiling space, except for the concrete floor slabs supporting the first-floor areas. Planks were generally supported by brickwork masonry walls or boxed, down-stand beams. Location 12 had an equal angle section bolted to the head of the wall to support the planks. This angle was present along the eastern end of the wall only. There was some distress noted to the surface of the planks in the form of spalling near the plank edges, this is believed to have been related to installation. No clear evidence of water ingress or notable deflections were noted. The width of bearings and internal reinforcement at the support could not be measured.	

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Location	Comment	Image
External facade	RAAC not observed / No action The external façade comprised stretcher bond brick masonry, PVCu window joinery and a shallow fall roof with a gravel chip layer.	

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CONCLUSIONS

RAAC was found in most of the locations inspected, suggesting it is present throughout the building.

Where observed it has been classified according to the 'panel condition matrix' shown in table 4 of the IStructE's guidance document1 which is re-produced below. In most cases this results in an 'Green' rating, which requires a triennial inspection, although one location required an annual inspection.

Risk assessment if water ingress is observed

Deflection	Major Cracking or spalling	Minor cracking/ or spalling within 500mm of support	Minor cracking or spalling away from the supports	No visible defect
Deflection >span/100	Red	Red	Red	Red
Span/100<Deflection<span/200	Red	Red	Red	Red
Span/200<Deflection<span/250	Red	Red	Amber	Amber
Deflection<span/250	Red	Red	Amber	Amber

Risk assessment if NO water ingress is observed

Deflection	Major Cracking or spalling	Minor cracking/ or spalling within 500mm of support	Minor cracking or spalling away from the supports	No visible defect
Deflection >span/100	Red	Red	Red	Red
Span/100<Deflection<span/200	Red	Red	Amber	Amber
Span/200<Deflection<span/250	Red	Amber	Green	Green
Deflection<span/250	Red	Amber	Green	Green

Classified according to the 'support condition matrix' shown in table 2 of the same guidance, and reproduced below, the rating would provisionally be 'Red'. This is primarily because the width of bearings, and inclusion of reinforcement beyond the face of the support, cannot be confirmed without intrusive work, which is not part of

a visual discovery inspection, albeit it is assumed that many bearings will be less than 75mm because this requirement did not exist when the structure was designed and built.

Support / bearing condition	Risk Category
Bearing investigated and found to lack required transverse reinforcement	Red (Critical)
Cut or modified panels, including where cut panels are supported on proprietary hangers	Red (Critical)
Bearing <75mm with transverse anchorage reinforcement	Red
>75mm with transverse anchorage reinforcement	Green

Where it is easier to extend the existing bearings than it would be to implement a programme of disruptive investigative work, we recommend that this be done.

Where enhancement is not practical or desirable, for example, due to the presence of building services or other internal fixtures, or simply because of the live environment, investigation may be a better option, especially when done from above.

We have provided below a strategy for dealing with these scenarios and we have also raised several other issues that are relevant, but are not addressed directly by the standard classification systems:

BEARINGS

The existing bearings have thus far proved satisfactory, which implies that they are either sufficiently wide, and adequately reinforced, or that the full design load has never been applied. To help maintain this situation a standalone document ‘WSP-RP00-02-Mitigations-01’ has been prepared which sets out mitigations that can be used to manage the structure, especially prior to enhancing the bearings or carrying out intrusive investigations.

We have also prepared a standalone document, ‘WSP-RP00-01-RAAC-Bearing-01’, that describes the investigation process. The intention for such work would be to permit a holistic risk assessment based on the findings.

LONG-TERM PLANNING

We recognise that in the long-term it is human nature for complacency to take root, especially if there is an extended period of operation without incident. We also recognise that corporate memory can be diminished.

by staff retirements or changes of employment. This means that maintaining recommended mitigations in the long-term is likely to become a challenge and for this reason, we recommend that the Health Board make use of the recommendations we have made in the short-term, but also make plans for the longer term. An example of such an approach would be to plan for decant to an alternative location while permanent works are carried out. That said, it is not within the scope of this report to propose or finalise such a strategy.

RISK ASSESSMENT

The focus of this report is the mitigation of risk directly attributable to RAAC, however it does not address the risk to patients of cancelled or deferred treatment were important facilities closed. We are not qualified to comment on or assess this risk, however we bring it to the Health Board's attention to highlight that there is a balance to be achieved. The point of balance will necessarily be different for different forms of occupancy.

LOUGHBOROUGH UNIVERSITY TESTING

We are aware of empirical testing being undertaken by Loughborough University, the results of which have not yet been published. Should the published results change our understanding of RAAC's behaviour in a way that is relevant to our assessment then we will inform the Heath Board of this and make further recommendations, as necessary.

SUMMARY

We have noted in this report that there is RAAC present within the building and that where observed it is generally dry, free from distress and has not deflected excessively, albeit this can change if the building is not adequately maintained. There were some locations where water penetration and or minor distress was observed and for this reason, annual inspection has been recommended overall.

We have also noted current guidance on support bearings, which is intended to address the potential for brittle failure. Where it is the most practical solution, we have recommended bearing enhancements to align with the requirements. Where this is not practical, we have recommended intrusive investigation and have provided a stand-alone document setting out the relevant issues. We anticipate that this will result in a more informed and holistic risk assessment.

Finally, we have recommended that the Health Board make use of our management and monitoring mitigations, contained in a stand-alone document, in the short term, but also consider longer term plans to move away from reliance on them.