

NDDH RAAC Risk Assessment

Reference Number: RDF1992-23

Date of Response: 30/01/24

Further to your Freedom of Information Act request, please find the Trust's response(s) below:

Please be aware that the Royal Devon University Healthcare NHS Foundation Trust (Royal Devon) has existed since 1st April 2022 following the integration of the Northern Devon Healthcare NHS Trust (known as Northern Services) and the Royal Devon and Exeter NHS Foundation Trust (known as Eastern Services).

I am writing to request, under the Freedom of Information Act, a copy of the most recent risk assessment carried out regarding the safety of buildings on the site of North Devon District Hospital (NDDH) constructed using Reinforced Autoclaved Aerated Concrete (RAAC).

Answer: Our Trust holds the information requested.

Please see: *RAAC Report Mott MacDonald_Redacted.pdf* attached. This refers to two pages of a Haldon's report: *RAAC Haldons Six Facet Survey Report pg42-43.pdf*, also attached.

Please note, staff names have been redacted (on page 7) under Section 40 (2) of the Freedom of Information Act 2000 Personal Information, where disclosure may contravene the Data Protection Act 2018 and therefore applies an exemption under Section 40 (2) - Personal Information of the Freedom of Information Act 2000 and Section 10 of the Data Protection Act 2018.

North Devon Hospital

North Devon NHS Foundation Trust

RAAC Visual Assessment Report

Client: National Health Service England (NHSE)

Date of Survey 06/09/2023

Date of Report 12/09/2023

Document Number

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RAAC Confirmed	Yes
Further Action Required	No

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North Devon Hospital

RAAC Visual Assessment Report



Document Revision

Rev	Purpose	Checked	Approved
P01	First Issue	Yes	Yes
P02	Updated following minor comments	Yes	Yes

Information Class : Confidential

Use of this report by the Building Owner / Operator

This report is provided for use by the National Health Service England (NHSE) (the client).

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

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This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

RAAC Visual Assessment Report

Executive Summary

A site visit was undertaken on: *6th September 2023*

The visit was undertaken on behalf of the NHS England. The following observations were made in relation to the presence of RAAC at the specific healthcare site / property.

Where critical actions have been highlighted, these should be reviewed by the responsible body / building operator / estates team in conjunction with the NHS.

The report should be read in full to understand the wider context.

NHS Contact

For any clarification regarding this report please contact the NHS.

Block	RAAC Present	Further Action Recommended	Any other areas of significant concern
Link corridor	Yes	No	Minor signs of cracking and spalling to concrete panels. Exposed rebar to external panel.

Further Action Required	Further Action Reason
No	RAAC located within site visit is of low to medium risk and further action is not required outside of ongoing building maintenance.

RAAC Visual Assessment Report

Introduction

Mott MacDonald has been appointed on behalf of the National Health Service England (NHSE) to provide a visual inspection of the existing buildings at the above site to determine the presence, and initial condition, of Reinforced Autoclaved Aerated Concrete Panels (RAAC).

This report provides a summary of the inspection, commentary on the findings and recommendations for further actions where appropriate. It is ordered in to the following sections for ease of navigation.

Site description – illustrates the extent of the site and the associated Building References. The building references are those used by NHS.

Desk study – summary findings from our review of information made available prior to the visit. The purpose of the desk study is to plan a safe visit and to determine whether a visual inspection is required.

Site Wide Summary – provides a high level overview of the location of RAAC across all buildings.

Block by Block Findings – for each Building the findings are presented as follows:

- Overall summary - covers the form of construction, extent of inspection, general observations, presence of RAAC and any requirements for further action.
- Photographs – grouped by those that illustrate the form of construction and those that show any areas of significant concern.

Appendices

- Background of RAAC

Limitations

The report has been produced with the following limitations:

- The visual survey is limited by areas accessible at the time of the visit and should not be considered as exhaustive;
- No inspection of roof finishes or condition has been undertaken;
- The presence of water-leaks has not been confirmed and is based on visual observations and/or anecdotal evidence from discussions during the visit;
- No review of weatherproofing of the building fabric, rainwater goods, drainage systems or services has been undertaken;
- Proposed management, remedial works and risk assessments are outside the scope of this report.
- The risk rating provided within this report should be considered as 'initial' and should be verified though a comprehensive survey in accordance with the IStructE guidance.



Aerial photograph of building Google Maps (2023)

Site Description

North Devon District Hospital is built to the North East of Barnstaple and has a range of linked or separate buildings.

The hospital is made up of a range of buildings of different ages and use. It was constructed on the site and opened in 1979 when services were transferred over from the North Devon Infirmary.



Plan showing summary of site

RAAC Visual Assessment Report

Previous information review

The following information has been reviewed.

Extract from Haldons Six Facet Survey Report (Draft)- Section 5.0 RAAC Concrete Identification- p42 & 43 received 4^h September 2023

Asbestos

No records provided.
Discussed on site.

RAAC Visual Assessment Report

Site visit
 The following section summarises the block by block inspection for RAAC.

Date of Inspection: 6th September 2023
Weather at time of inspection: Fine and dry
Roles of those met on site:
 [Redacted] Mott MacDonald
 [Redacted] NHSE SW
 [Redacted] RDUH NHS FT
 [Redacted] RDUH NHS FT
 [Redacted] NHS Devon

Block	RAAC Present	Further Action Recommended	Any other areas of significant concern
Link Corridor	Yes	No	Minor signs of cracking and spalling to concrete panels. Exposed rebar to external panel.

General commentary on site visit including general access granted
 RAAC was previously identified to the link corridor on the North Devon District Hospital Site that connects the main building to the Ladywell Unit along with the Psychiatric OPD and Endoscopy units.
 The link corridor was free to access with no restrictions. Some ceiling tiles had been removed to allow inspection above.

North Devon Hospital

RAAC Visual Assessment Report

Building Reference: Link Corridor

Building Summary

Site Data

Block Age: Unknown

Finishes and coverings: RAAC panels to walls
Metal deck to roof

Suspended Ceilings Present: Yes

Extent of Inspection

Visual inspection from ground level to perimeter of building
Visual inspection through roof removed roof tiles into ceiling void

Form of Construction

Steel frame supporting metal deck roof and providing restraint to external non load-bearing RAAC wall panels. Wall panels are formed using vertically aligned RAAC panels with a painted finish, stacked off a concrete plinth at the base and supported by the steel frame at the head..

General Observations

N/A

RAAC Present

(with high degree of confidence)

Yes

Any other areas of concerns from RAAC installation

The site visits completed are considered an initial inspection only. The observations of RAAC made on this site visit are recorded below:

RAAC was observed during site visit as described. The condition was good in general for the age of the structure and showed minor signs of localised damage.

There was a panel where the AAC had spalled away from the internal rebar but due to the localised corrosion protection of the reinforcement there was no significant signs of deterioration.

Any future fixings should be carefully considered due to low-strength of RAAC panels

Any other areas of significant concern observed

The site visits completed were only to consider the presence and the condition of RAAC panels, however, if other areas of significant concern were noted during the visit, these are recorded below:

N/A



Further Actions

The following further actions are recommended:

Localised repairs to the damaged areas is recommended alongside the planned maintenance of the building.

Investigation into connections should be undertaken to confirm connection form.

RAAC Risk Rating

Risk rating of the encountered RAAC:

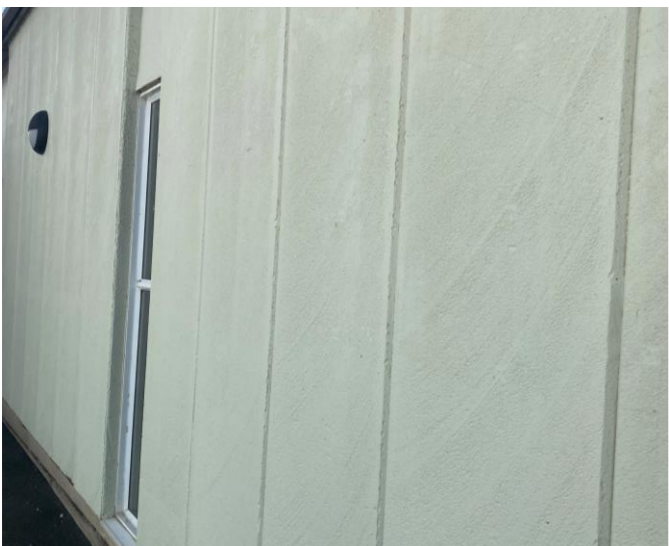
Medium



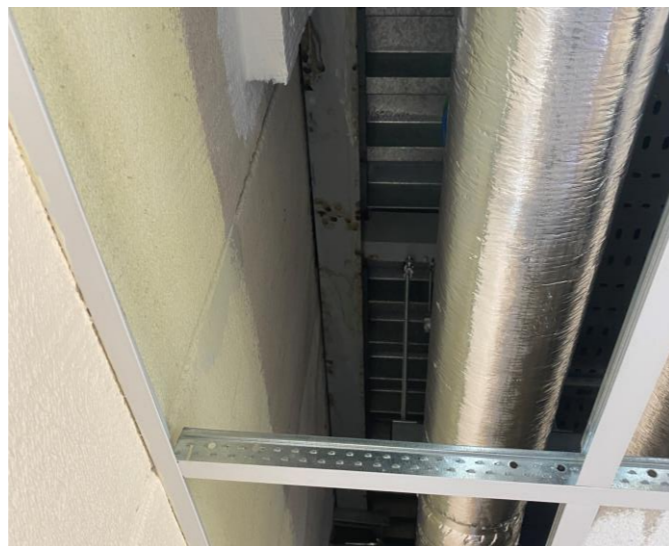
Form of Construction Photo 1
Elevation. Panelised construction



Form of Construction Photo 3
Photo at location of spalling showing reinforcement.
No signs of corrosion to exposed reinforcement.



Form of Construction Photo 2
Elevation. Panelised construction



Form of Construction Photo 4
Metal deck roof construction and support to RAAC panels

Form of Construction Photo 5

Form of Construction Photo 7

Form of Construction Photo 6

Form of Construction Photo 8



Appendix 1

RAAC Background

RAAC Visual Assessment Report

Why is the presence of RAAC important?

Historic RAAC panel failures have included significant collapses of whole roof structures, occurring suddenly with very little warning. This is typical of shear failures in cementitious materials. An example (extracted from the 2018 SCOSS report) is shown bottom right.

The presence of RAAC panels is an important health and safety issue, even when they visually appear to be in good condition.

Background

Reinforced Autoclaved Aerated Concrete (RAAC) panels are formed using Autoclaved Aerated Concrete (AAC). This form of concrete is less dense than traditional non-aerated concrete as the matrix uses finer cements and chemicals within the casting process to form gas bubbles.

RAAC elements were most commonly used in roofs but examples also exist in floors or façade panels.

AAC is weaker than traditionally formed concrete and due to the concrete aerated matrix created, has a lower bond capacity to embedded reinforcement and offers lower protection to that reinforcement. Typical characteristics of RAAC panels are described below:

- **Compressive strength:** Compressive strength, as well as flexural, shear and tensile strengths, are much lower than traditional concrete.
- **Reinforcement anchorage:** Due to the aerated nature of the material, the AAC will not form adequate bond strength with the reinforcement. The reinforcement used in RAAC panels was often smooth and not ribbed.
- **Permeability:** The aerated material is highly permeable, so cover to the reinforcement does not protect against environmental conditions in the same way as with traditional concrete. Prior to manufacture, the reinforcement was typically coated to protect it against corrosion.
- **Elasticity and Creep:** The aerated nature and lack of coarse aggregate means that RAAC panels experience a greater degree of creep and long-term deflection when compared to traditional concrete.



Development of RAAC understanding and Guidance

Concern regarding the structural adequacy of AAC / RAAC elements was raised in the early 1990's. Surveys undertaken by the **Building Research Establishment (BRE)** at this time identified excessive and progressive displacements of roof panels formed using RAAC; causing water-ponding and failure of roof finishes. This failure of the waterproofing layer gives potential for future degradation of embedded reinforcement. This resulted in the BRE information paper in 1996 highlighting the risks of such panels. Following significant collapse of a school roof in 2017 / 2018, further concerns related to the adequacy of bearings for RAAC panels were raised.

In May 2019 the **Standing Committee for Structure Safety (SCOSS)** issued an alert highlighting the risks associated with RAAC elements 'Failure of Reinforced Autoclaved Aerated Concrete (RAAC) Planks'.

In February 2022, the **Institution of Structural Engineers (IStructE)** published supporting guidance to help with the assessment of RAAC Panels. It identified the following concerns:

- Rusting of embedded reinforcement leading to cracking and spalling of the AAC cover.
- Cracking, of varying degrees of severity related to thermal, creep and movements in the planks.
- Excessive deflections that may impact on bearing stresses
- In some cases, the deflections had become appreciable, with span-to-deflection ratios in the order of 100. This led to potential for ponding of rainwater, the associated imposed loading increase, distress to certain types of waterproof membrane and associated finishes, and water penetration sufficient to promote corrosion of the embedded reinforcement.
- Reduced bearing widths impacting on shear stresses and potential for brittle failure.

In December 2022 the **Department for Education** published Reinforced Autoclaved Aerated Concrete (RAAC) Estates Guidance. It presented a 5 stage approach to the identification and management of RAAC in educational buildings which outlines steps that should be taken by those responsible for management of educational buildings and how to procure building professional's services when specialist advice is needed.

The **IStructE RAAC Study Group** issued guidance on structural risk factors and their impact on assessment, remediation and management of RAAC. Updated guidance was published in April 2023, the guidance has informed both the assessment methodology and the information provided in this report.



RAAC Visual Assessment Report

Approach to RAAC Risk Rating

Within this report, the RAAC panel installation risks have been quantified using a RAG rating system, in line with the evolving Institution of Structural Engineers (ISE) Guidance. This RAG rating is described within the table below along with potential actions associated with that risk rating.

The risk rating is directly associated with the risk concerns considered for RAAC panels, including reduced end-bearing, poor anchorage, cut-panels, water penetration, excessive deflection and adverse or modified loading conditions. This rating should be considered an initial risk rating of the overall installation, with any critical elements that need immediate action being highlighted.

Risk Rating	Example Potential Action
Critical (RED)	Requires immediate exclusion, remedial works or temporary propping to allow the safe ongoing use of a building. Depending on the extent, this may be part or all of the building. Requires an awareness campaign for occupants including exclusion zones
High (RED)	Requires remedial action or further investigation as soon as possible Requires an awareness campaign for occupants, which may include exclusion zones, signage, loading restrictions and the need to report changes of condition, e.g., water leaks, debris, change in loading etc
Medium (Amber)	Requires inspection and assessment on a regular basis, e.g. annually (frequency to be suggested by a suitably qualified and experienced Chartered Engineer) Requires an awareness campaign for occupants, which may include signage, loading restrictions and the need to report changes of condition, e.g. water leaks, debris etc
Low (Green)	Requires inspection and assessment on a regular basis, e.g. every 3 years (frequency to be suggested by a suitably qualified and experienced Chartered Engineer) depending on condition Requires an awareness campaign for occupants, which may include signage, loading restrictions and the need to report changes of condition, e.g. water leaks, debris etc. Few cases are expected to fit in to this category.



Examples of RAAC panel installation – not applicable to this site

Terms of Reference

- The brief for visual appraisal has been defined in agreement with NHS England as follows:
- Attend site and undertake visual inspection of suspected RAAC installations, as directed/
- Confirm any limitations of visual inspection works
- Confirm, or otherwise, the presence of RAAC within buildings
- Discuss, where observed, the initial risk rating of RAAC installations
- Propose next steps

Reference Documentation

Our visual inspection has drawn upon the following published guidance documentation:

- CP116: 1965 & 1969 – The structural use of precast concrete in buildings
- CP 114:1957- The structural use of reinforced concrete in buildings
- CP3: 1952 - Code of functional requirements of buildings; Chapter V; Loading
- IStructE (October 2010), Appraisal of Existing Structures – Third Edition, IStructE, London.
- Black, W et al (1987), CIRIA Guide 111, Structural renovation of traditional buildings, CIRIA, London
- Concrete Society (2009), Technical Report 70; Historical Approaches to the Design of Concrete Buildings and Structures, CCIP, London
- BISRIA (1999), Guidance Note 8/99; Refurbishment of Concrete Buildings – Structural & Services Options, BISRIA, London
- BRE (1996), IP10/96 Reinforced autoclaved aerated concrete planks designed before 1980, BRE, London
- BRE (2002), IP7/02 Reinforced autoclaved aerated concrete panels: test results, assessment and design, BRE, London
- Department of Education (2021), Reinforced Autoclaved Aerated Concrete (RAAC) Estates guidance, 2022, DfE, London
- Institution of Structural Engineers (April 2023) Reinforced Autoclaved Aerated Concrete (RAAC) Panels Investigation and Assessment, ISE, London
- Siporex (1972) Siporex Autoclaved Aerated Concrete Building Products.





5.0 RAAC CONCRETE IDENTIFICATION

An inspection of all buildings the site has been undertaken to assess whether RAAC (Reinforced Autoclaved Aerated Concrete) planks have been used within the main elements of the buildings' construction. In recent years the need to identify the use of RAAC planks has become important due to a number of recorded failures.

RAAC planks were typically used between 1960 and 1980 for the construction of wall panels, floors and roofs, therefore buildings and or extensions constructed pre 1960 and post 1980 are unlikely to have been constructed using RAAC susceptible to failures according to BRE (Building Research Establishment).

Following identification of any RAAC elements further investigations will be required to assess its condition and adequacy.

Main Block & Ladywell

Element	Form of Construction	Evidence of RACC
Main Roofs	Flat roofs being of concrete construction formed predominantly over woodwool formwork, supported by precast concrete beams. Roofs are provided with mineral felt coverings. Roof level plant rooms provided with profiled steel cladding sheets.	No evidence of RAAC
Main External Walls	Reinforced concrete frame with traditional cavity masonry walling panels, faced brickwork finishes provided externally. Link corridor to Level 00 has RAAC panels	Evidence of RAAC within external walls only to link corridor
Internal Floors	Mixture of ground bearing and suspended concrete. Suspended concrete largely provided with permanent woodwool formwork. Higher load areas (plant rooms formed using shuttered cast in situ concrete.	No evidence of RAAC
Internal Partitions	Mixture of traditional masonry and lightweight partitions having plaster finishes.	No evidence of RAAC

Residences

Element	Form of Construction	Evidence of RACC
Main Roofs	Pitched roofs with tile coverings over timber roof structures.	No evidence of RAAC
Main External Walls	Traditional cavity masonry walling with brick plinths and rendered elevations.	No evidence of RAAC
Internal Floors	Mixture of ground bearing and cast in situ suspended concrete.	No evidence of RAAC
Internal Partitions	Mixture of traditional masonry and timber partitions having plaster finishes.	No evidence of RAAC



David Barlow Unit

Element	Form of Construction	Evidence of RAAC
Main Roofs	Pitched roofs with tile coverings over timber roof structures.	No evidence of RAAC
Main External Walls	Traditional cavity masonry walling with rendered elevations.	No evidence of RAAC
Internal Floors	Assumed ground bearing concrete.	No evidence of RAAC
Internal Partitions	Mixture of traditional masonry and timber partitions having plaster finishes.	No evidence of RAAC

Estates & Facilities Buildings

Element	Form of Construction	Evidence of RAAC
Main Roofs	Flat roofs formed using profiled steel decks with a mixture of felt and single ply coverings.	No evidence of RAAC
Main External Walls	Traditional cavity masonry walling with brick elevations.	No evidence of RAAC
Internal Floors	Mixture of ground bearing and suspended concrete.	No evidence of RAAC
Internal Partitions	Mixture of traditional masonry and timber partitions having plaster finishes.	No evidence of RAAC

Wellbeing Unit

Element	Form of Construction	Evidence of RAAC
Main Roofs	Shallow pitch roof formed using profiled steel decks with mineral felt covering over.	No evidence of RAAC
Main External Walls	Traditional cavity masonry walling with brick elevations.	No evidence of RAAC
Internal Floors	Ground bearing concrete.	No evidence of RAAC
Internal Partitions	Mixture of traditional masonry and timber partitions having plaster finishes.	No evidence of RAAC

Following a visual inspection of accessible areas within the buildings summarised above, there are no indications to suggest the presence of RAAC being used with the construction of the buildings, except for the construction of walling to the South link corridors on Level 00. These wall panels display signs of re-bar corrosion and delamination. The wall panels are deemed to be at the end of their effective life and should ideally be replaced. The risk of failure, however, is low given their use and scale.