Local Government, Housing and Planning Committee

23rd Meeting, 2023 (Session 6)

Tuesday 3 October 2023

Reinforced Autoclaved Aerated Concrete (RAAC)

Introduction

1. At its meeting on 12 September the Committee agreed to hold a roundtable session on the issue of potentially defective Reinforced Autoclaved Aerated Concrete (RAAC) elements in public buildings across Scotland, which may be at risk of sudden, catastrophic failure.

2. The Committee is particularly keen to understand the extent of the problem in local authority owned and managed buildings and whether Councils have the staff and resources necessary to survey buildings with RAAC elements, and to take remedial action where this is found to be necessary.

3. The Committee will also consider how the Scottish Government is supporting local authorities to respond to this problem.

4. This paper sets out the background to this issue and the evidence the Committee will be taking to inform its consideration.

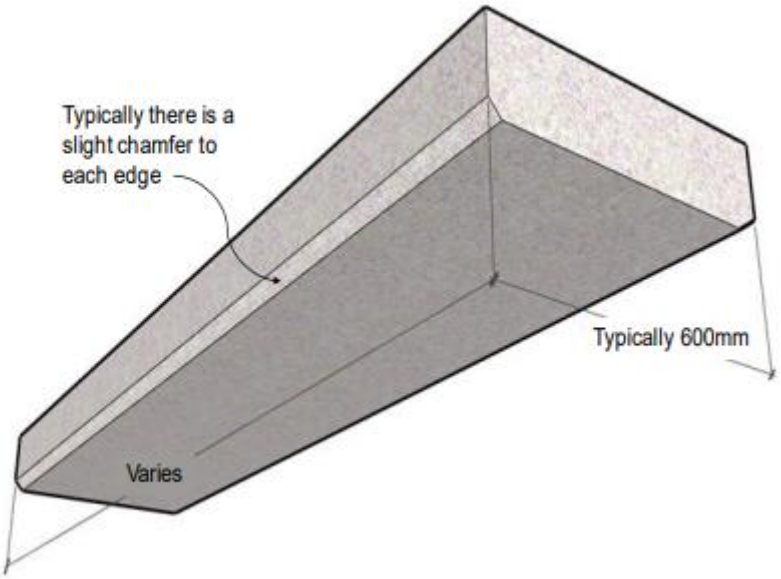
Background

5. RAAC is the acronym for Reinforced Autoclaved Aerated Concrete. Over the last few months, the issue of defective RAAC elements in UK public buildings and the risk of their sudden, catastrophic failure has been headline news. This short paper describes what RAAC is, how defects arise, and how they are found and fixed. It goes on to look at what action to find, assess and remediate defective RAAC elements in public buildings has been taken by the Scottish Government and local authorities to date.

What is RAAC?

6. It is important to understand that RAAC is very different from traditional concrete, which is a mix of water, cement, sand and aggregate (small stones), that is typically mixed, poured and set in-situ on building sites. RAAC is prefabricated in a factory and delivered to building sites in the form of panels, which can be used in roofs, walls and floors.

Profile of a RAAC panel.



Source: UK Government

7. RAAC panels have two key elements:

- **Aerated Concrete:** This is made by adding aluminium powder to a lime or cement based concrete mix, which does not contain any aggregate larger than sand. This mix is cast in a mould. The aluminium powder reacts with the lime/cement and water to produce millions of tiny gas bubbles, substantially increasing the volume of the material. The product is then cured in an autoclave for between eight and 15 hours at high temperature and pressure, to control shrinking and encourage the formation of strongly binding molecules within the concrete.
- **Reinforcing:** RAAC panels are given added strength by lattices of steel reinforcing rods, which are covered in an anti-corrosion coating. Reinforcement is placed into the mould before the concrete mix is added.

Why use RAAC?

8. In the UK, RAAC was used as a building material between the late 1950s and late 1990s, often in the construction of flat roof decks – which were then coated with

waterproof roofing material. RAAC was used as it is lightweight, has good thermal insulating properties, is relatively cheap, and is quick and easy to install.

Potential RAAC defects

9. RAAC, if it is manufactured, installed, and maintained correctly, poses no more danger to building users than most other construction products. However, concerns that RAAC elements of some buildings could be liable to fail under certain circumstances and that the product has a relatively limited lifespan have been recognised for decades. The BRE (Building Research Establishment) explored these issues in a paper published in 1996 which estimated the usual lifespan of RAAC panels to be around 30 years. An alert issued by the Standing Committee on Structural Safety in May 2019 advised that all pre-1980 RAAC panels in UK buildings had significantly exceeded their expected service life and should be considered for replacement.

10. The Institution of Structural Engineers categorise potential RAAC defects under three headings, performance, manufacturing, and construction. The list is extensive and the description of defects technical. The key possible RAAC defects identified by the Institute are briefly described below:

Performance defects

- Deflection of panels, in effect they begin to sag over time.
- Cracking on the underside of panels, known as spalling.
- Corrosion of steel reinforcement and/or reduction in the integrity of the concrete due to water ingress.
- Overloading, which can be caused by water ponding in deflections on flat roofs.
- Panels acting independently rather than as a single unit, limiting load sharing across a structure.

Manufacturing defects

- Poor quality manufacture and placement of the steel reinforcement within RAAC panels may leave them susceptible to failure. A particular concern is where steel reinforcing does not extend along the full length of a panel, leaving the load bearing end section weaker than it should be, meaning it is more likely to fail.
- Small gaps (voids) in the aerated concrete caused by gas bubbles coalescing around the steel reinforcement during manufacture.
- Incorrect or poorly applied anti-corrosion treatment of steel reinforcement.

Construction defects

- Builders have cut RAAC panels post-manufacture to fit the required size, compromising their strength and integrity.
- RAAC panels resting on very short sections of supporting beams, increasing stresses on panel ends. This is a particular problem where there are manufacturing defects, such as the incorrect placing (or lack) of steel reinforcement near panel ends.
- Missing reinforcement such as links between the ends of panels that have been butted together.
- Structurally damaging maintenance or building conversion work, such as holes being drilled or cut through panels, reducing their structural integrity. Another maintenance issue is where a RAAC roof has been re-surfaced since original construction – particularly if this increases the load on the roof or where a black finish has been used when the original was another colour, as it will likely retain more heat.

11. A more general concern is that the manufacture of panels was highly inconsistent and the quality control poor, meaning there can be quite wide variations in the quality and physical characteristics of panels used within a single building.

12. It is worth noting that since 2008, new standards have applied to RAAC products used in UK construction, removing the scope for failure and improving the lifespan of such products.

Identifying RAAC defects

13. Advice on identifying RAAC and possible defective RAAC building elements has been produced by several organisations including the Institution of Structural Engineers, UK Department for Education, and NHS Scotland National Services. Much of this advice is highly technical and is aimed at specialist surveyors and engineers. However, advice to building managers is fairly consistent, generally recommending that:

- The possible presence of RAAC should be identified through a desktop review of building plans and documentation, where it exists, and a simple visual inspection of the building by appropriate staff. This can be complicated by the fact RAAC panels are often hidden behind suspended ceilings and under roofing materials, some of which could contain asbestos – meaning they cannot be moved or tampered with by non-specialist staff.

- Where RAAC is found to be present, or it is suspected to be present, a qualified engineer or surveyor should be employed to undertake a detailed investigation of its condition. A risk assessment may also need to be conducted, which will consider whether and how the space beneath RAAC panels should be used in the interim period.

- The surveyor or engineer will report on the condition of any RAAC elements and, if appropriate, recommend remedial action.

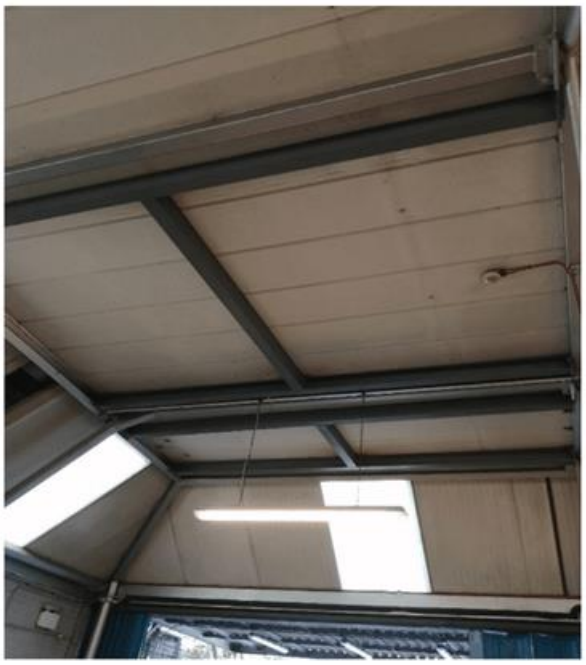
Fixing RAAC defects

14. The Institution of Structural Engineers highlights in guidance that remedial action can include:

- Emergency propping of roofs or ceilings, when panels are deemed to be in a very poor condition.
- Strengthening the support under the ends of RAAC panels, known as end bearing strengthening, to mitigate against known defects or unknown/unproven defects to the load bearing ends of RAAC panels.
- Permanent remedial supports, to actively take the loading from the panels.
- Passive, fail safe supports, to mitigate catastrophic failure of the panels if a panel was to fail.
- Removal of individual panels and replacement with an alternative lightweight solution.
- Entire roof replacement.
- Periodic monitoring of the panels for their remaining service life.

Illustrations of remedial action

End bearing strengthening



Intermediate supports

Source: Institution of Structural Engineers.

Action by the Scottish Government and local authorities

15. The Scottish Government has issued guidance on RAAC to local authorities via the Scottish Heads of Property Services and the Association of Directors of Education in Scotland. Local authorities are currently undertaking investigations into the presence of RAAC in their buildings.

16. The Scottish Government has convened a cross-public sector working group on RAAC, which met for the first time on 14 August 2023.

17. Data from inspections carried out by local authorities, which has been collated by the Scottish Government and published on 8 September 2023, shows that there are 16 council areas where schools have been found to include RAAC elements. These are:

- Aberdeen City
- Aberdeenshire
- Argyll and Bute
- City of Edinburgh
- Dumfries and Galloway
- Dundee City
- East Ayrshire
- East Lothian
- Glasgow City
- Highland
- Inverclyde
- Moray
- North Ayrshire
- North Lanarkshire
- Perth and Kinross
- West Lothian

18. To date, 41 Scottish schools have been found to contain some RAAC elements, which includes eight early learning and childcare settings within primary schools.

19. At present, data on the number of other types of public building containing RAAC elements, and the extent of remedial action needed to deal with any defects found, is limited. The Cabinet Secretary for Social Justice indicated in answer to a parliamentary question on 19 September 2023 that:

> "Survey work is underway across public buildings and is at various stages of discovery in different sectors.
>
> Where the presence of RAAC is confirmed in a public building, we expect the owner to take appropriate measures to assess and manage any risk identified, following the Institution for Structural Engineer's current guidance on this process."

20. Details of eventual remediation and mitigation costs are not available. However, the Scottish Government stated in answer to a parliamentary question published on 31 July 2023 that:

> "From our discussions with local authorities regarding RAAC to date, West Lothian Council indicated that addressing RAAC issues across its estate could cost around £76.8m, whilst East Lothian Council advised that costs

> relating to one affected school are estimated at around £3.8 million. The current information gathering exercise offers the opportunity to identify similar assessment made by other local authorities."

21. The Cabinet Secretary for Social Justice wrote to the Committee on 26 September 2023, in response to the Committee's letter of 14 September 2023 posing several questions on RAAC in Scottish public buildings. The Cabinet Secretary's response highlighted that:

> "My officials are working with the Scottish Housing Regulator to coordinate a data gathering exercise across all social housing providers. This will seek to confirm action being taken by providers to identify RAAC within their stock and timescales for reporting on both discovery and on subsequent assessment and recommended action in confirmed RAAC dwelling types.
>
> We anticipate that initial reporting on current activity and timescales will be received during October. In parallel, we are also engaging with private sector housebuilders to gain insight, but not data, on likely prevalence of RAAC."

22. Copies of the Committee's letter and the Cabinet Secretary's response are attached as an annex to this paper.

Evidence programme

23. To inform its consideration of this issue, at this week's meeting the Committee will take evidence in a roundtable format from:

- David Baird, Property Services Manager, West Lothian Council;
- Stephen Booth, Chief Officer, Aberdeen City Council;
- Peter Drummond, Chair of Practice Committee, Royal Incorporation of Architects in Scotland;
- Professor Chris Goodier, Senior Leadership Team, School of Architecture, Building and Civil Engineering, Loughborough University;
- Martin Liddell, Chair of Study Group, Institution of Structural Engineers;
- Paul Jones, Strategic Assent Improvement Manager, City of Edinburgh Council;
- Paul Livesey, Scheme Manager, Collaborative Reporting for Safer Structures (CROSS);
- Ailsa Macfarlane, Director, Built Environment Forum Scotland;

- Iain Morris, Acting Director of Asset Management, Scottish Fire and Rescue Service;
- Sam Piplica, Senior Specialist, Building, Royal Institution of Chartered Surveyors (RICS);
- Peter Watton, Service Director, City of Edinburgh Council, SOLACE;

24. The Committee will then hear from the Cabinet Secretary for Social Justice and COSLA.

25. Following the session the Committee will reflect on what further steps it would wish to take.

Clerks to the Local Government, Housing and Planning Committee and Alan Rehfisch, Senior Researcher, SPICe Research

Annex

Correspondence with the Cabinet Secretary for Social Justice on RAAC

Dear Shirley-Anne,

Reinforced Autoclaved Aerated Concrete

The Local Government, Housing and Planning Committee has agreed to look at the issue of potentially defective Reinforced Autoclaved Aerated Concrete (RAAC) elements in public buildings across Scotland, which may be at risk of sudden, catastrophic failure.

The Committee is particularly keen to understand the extent of the problem in local authority owned and managed buildings and whether Councils have the staff and resources necessary to survey buildings with RAAC elements, and to take remedial action where this is found to be necessary.

The Committee will also consider how the Scottish Government is supporting local authorities to respond to this problem.

You are invited to give evidence to the Committee on this issue at its meeting on the morning of 3 October. In advance of that the Committee would welcome an update from you on the Scottish Government's approach to dealing with RAAC in public buildings, with a particular focus on support, advice and guidance being provided to local authorities and how you see this work being taken forward. I would also be grateful for an update on what work is being down to identify RAAC in housing. I would be grateful for a response by **22 September**.

Please note that the Committee also intends to take evidence from stakeholders on this issue at the same meeting.

I am copying this letter to the Minister for Housing and the Minister for Local Government Empowerment and Planning and appreciate that it might be more appropriate for them to respond and/or to give evidence to the Committee.

I look forward to your response.

Yours sincerely,

Ariane Burgess
Convener, Local Government, Housing and Planning Committee

LGHP/S6/23/23/1

Dear Ariane,

Reinforced Autoclaved Aerated Concrete (RAAC)

Thank you for your letter of 14 September advising the committee will consider Reinforced Autoclaved Aerated Concrete (RAAC) on 3 October and inviting me to give evidence. My apologies for the short delay in replying to you.

I look forward to updating the committee at that time with the actions we are taking to support building owners, including local authorises, to limit their risk. I also welcome this opportunity to inform the committee of the information you requested in your letter, and I've set that out in Annex A.

Thank you again for raising this important issue. I trust this response reassures you about the Scottish Government's commitment to working with our partners across the public sector to understand and appropriately address this ongoing issue.

Yours sincerely,

Shirley-Anne Somerville

Annex A

Scottish Government response to questions raised in committee's letter of 14 September 2023

No	Question raised	Scottish Government Response	Published information
1	What is the *"extent of the problem in local authority owned and managed buildings"*	On 8th September the Cabinet Secretary for Education and Skills, Jenny Gilruth, highlighted the need for transparency on which schools have identified RAAC and the mitigations that local authorities have put in place to provide reassurance to parents, carers, staff and pupils. In relation to RAAC in schools, and unlike the differing arrangements across England the vast majority of schools in Scotland are managed by local authorities who have a consistent and informed approach to the management of their buildings. I have been advised by local authorities that they are currently aware that RAAC has been identified in 41 school buildings (which includes 8 early learning and childcare settings within primary schools), across 16 local authorities. All relevant local authorities have now published a list of those buildings alongside mitigation strategies. On transparency of public bodies' buildings more widely, I should explain that I expect information on affected buildings within the public sector will be provided by each responsible organisation.	Each local authority has published data relating to impacted schools in their area on their own websites.

		We are working with local authorities and the wider public sector to ensure that the presence or RAAC is identified, surveys are undertaken to identify risk and remediation, mitigation or monitoring measures are undertaken where that is found to be necessary.	
2	*"whether Councils have the staff and resources necessary to survey buildings with RAAC elements, and to take remedial action"*	Local authorities operate independently of central government and deliver their services recognising the respective mandates of local and national government. To address RAAC we have worked together in partnership with COSLA. I, and my colleagues, have met with them on several occasions and this has led to progress including an acceleration of RAAC surveys for schools. My officials are engaging with the Institution of Structural Engineers to understand proposals and timescales to build capacity for RAAC assessment amongst consulting structural engineers. Regarding any remediation, mitigation or monitoring of RAAC once identified and assessed, this remains the responsibility of the building owners, to manage their estate and ensure compliance with the relevant legislation. This includes their duties under health and safety legislation to maintain a safe workplace. Where assessment of RAAC in a building identifies a need for action, a timetable for such work should be agreed as part of the risk response.	• New Deal with Local Government – Verity House Agreement - gov.scot (www.gov.scot) • Each local authority has published data relating to impacted schools in their area on their own websites.

3	*"how the Scottish Government is supporting local authorities to respond to this problem"*	Our support to local authorities on RAAC is currently progressing in line with the Verity House commitment with officials working *"together to consult and collaborate as early as possible"* given local authorities' interest in this area. Specifically, my officials have supported responsible building safety across the public sector, including local authorities, by creating the RAAC Cross Sector Working Group (CSWG) which first met in August 2023. The purpose of this group is to help build an understanding of RAAC in buildings in Scotland by working in partnership, sharing information and discussion. This will inform the response by public bodies and private sector organisations, particularly as the Institution of Structural Engineers have indicated they are open to attending the next meeting. It will also contribute towards centralised data on RAAC in Scotland. Members of the CSWG include are, but is not limited to, Convention of Scottish Local Authorities (COSLA); Local Authority Building Standards Scotland; Association of Local Authority Chief Housing Officers; Scottish Housing Regulator; Association of Directors of Education Scotland; Scottish Heads of Property; and several individual local authorities. My officials are engaging with COSLA and Scottish Heads of Property on local authority investigation of RAAC in their estates beyond current reporting on schools.	• Reinforced Autoclaved Aerated Concrete (RAAC): Cross Sector Working Group - gov.scot (www.gov.scot)
4	*"Scottish Government's approach to dealing with RAAC in public buildings"*	Our approach is demonstrated by our current action though both direct sector engagement and our Cross Sector Working Group – to raise awareness of RAAC as an issue to investigate across the public sector. Where RAAC is discovered, we recommend	The Institution of Structural Engineers – Reinforced

		that owners follow the risk-based approach to identification and assessment published by the Institution of Structural Engineers in April 2023.	autoclaved aerated concrete (RAAC) planks
5	What *"support, advice and guidance being provided to local authorities"*	As set out at point 3 above, my officials continue to deliver support, advice, and guidance via the Cross Sector Working Group to support local authorities as they ensure their buildings are safe to use.	
6	*"how you see this work being taken forward"*	Going forward we will continue to support building owners to deliver responsible building safety by working with our public sector partners and key stakeholders, to ensure the latest information about RAAC is highlighted. We will also build a national picture of the extent of RAAC in Scotland to reassure the public that appropriate measures are being taken across the public sector as needed. I am aware of calls for a national fund to support public bodies to manage the works required to make good any buildings impacted by RAAC. As we set out immediately prior to recess we first need to understand the scope and nature of what we are dealing with before considering funding needs. That position currently remains unchanged as work to gather that information continues.	
7	*"what work is being done to identify RAAC in housing"*	My officials are working with the Scottish Housing Regulator to coordinate a data gathering exercise across all social housing providers. This will seek to confirm action being taken by providers to identify RAAC within their stock and timescales for reporting on both discovery and on subsequent assessment and recommended action in confirmed RAAC dwelling types.	The activity will be published within CSWG minutes, when available. The link for the CSWG is below:

		We anticipate that initial reporting on current activity and timescales will be received during October. In parallel, we are also engaging with private sector housebuilders to gain insight, but not data, on likely prevalence of RAAC.	Reinforced Autoclaved Aerated Concrete (RAAC): Cross Sector Working Group - gov.scot (www.gov.scot)