Department for Education

Reinforced Autoclaved Aerated Concrete: Lightweight Concrete Roofs

A guide for identification and initial action

February 2021

Contents

Summary

This publication provides non-statutory guidance from the Department for Education. It has been produced to help responsible bodies to identify reinforced autoclaved aerated concrete (RAAC) in schools.

Expiry or review date

This guidance will be reviewed before 31 March 2022.

Who is this publication for?

This guidance is for:

- Local authorities (for community and voluntary-controlled schools)
- Academy trusts (for academies and free schools)
- Governing bodies (for voluntary-aided schools)
- School leaders, school staff and governing bodies in all maintained schools, academies and free schools

Overview

The Local Government Association (LGA) has previously issued advice about **reinforced autoclaved aerated concrete (RAAC)** in schools, with the Department for Education also issuing an alert drawing attention to the LGA advice.

This guide provides further advice on how to identify RAAC and what steps to take if it is present.

RAAC is a lightweight, 'bubbly' form of concrete that was commonly used in school and other buildings from the mid-1960s to the mid-1980s. RAAC is mainly found in roofs, although occasionally in floors and walls. RAAC is less strong than traditional concrete and there have been problems as a result, which could have significant consequences.

A number of school building owners have already taken steps to identify RAAC. For those that have not, this guide explains how an owner (local authority, academy trust or governing body) can carry out an initial check to determine whether further advice/action are necessary. You may need to engage an appropriately qualified person to help carry out this initial check. If in any doubt seek qualified help from a chartered surveyor, structural engineer, architect, or other construction professional.

First Action

To establish if your buildings contain RAAC, follow the steps outlined below:

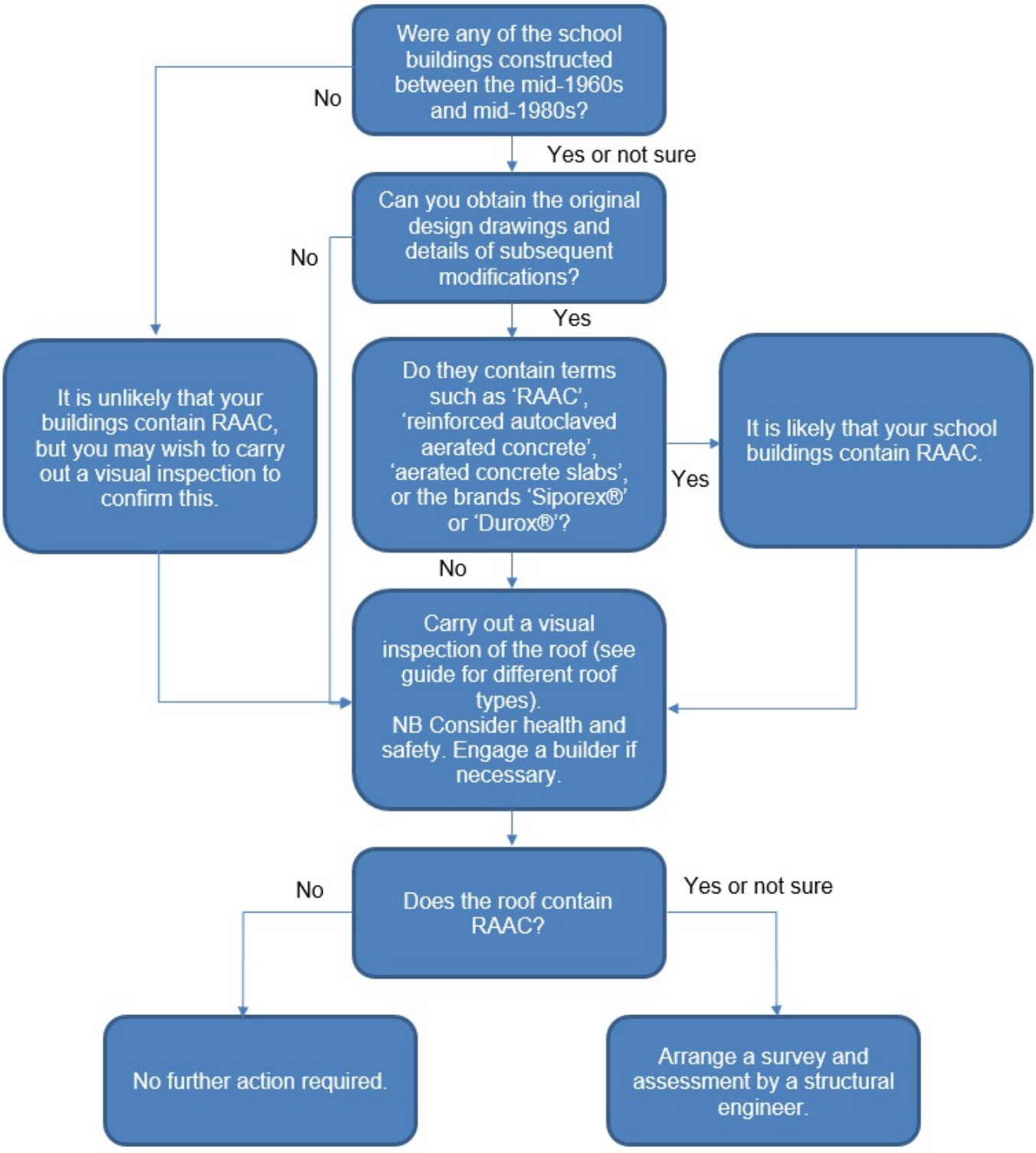

Figure 1 – RAAC identification process

What to look for if you think there may be RAAC?

RAAC has an open texture and open-sided bubbles can often be seen in it.

The surface is slightly crumbly when touched (unless it has been heavily painted or coated). It is easy to make a gouge with a screwdriver.

Figure 2 - RAAC sample showing 'bubbly' texture

Khan Thorne

The easiest way to identify RAAC panels is to look at the underside of the roof. RAAC panels are usually (but not always) 600mm wide and 2.4m long. They typically have a slight chamfer to each edge and often have arc-shaped stripes across the face. The colour varies from white to pale grey.

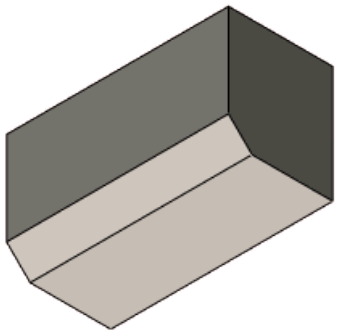

Figure 3 – Image of a chamfer edge[1]

[1] http://help.solidworks.com/2017/English/SolidWorks/Sldworks/HIDD_DVE_FEAT_CHAMFER.htm?format=P&value=

RAAC panels can be hidden behind suspended ceilings, so you may need to move a ceiling panel to inspect the roof. Access through a loft hatch may also be possible.

RAAC panels were used mostly on flat roofs, but can also be found on pitched or sloping roofs. They typically span between steel beams, but can also span onto masonry walls.

	
RAAC roof panels in sports hall Khan Thorne	RAAC roof panels Khan Thorne
	
RAAC roof panels David Robertson	RAAC roof panels accessed through suspended ceiling David Robertson

Figure 4 – RAAC roof panels

What to do if you suspect there is RAAC present

Before inspecting a roof, you (or the appropriately qualified person) should make a preliminary visit to identify any access and safety issues, understand the extent of work involved, and to undertake a risk assessment and plan the work. The height of the roof is an important safety consideration.

During the preliminary visit you should consider the following questions:

1. Can the underside of the roof be seen and/or accessed easily and clearly?

    If yes, take photos of the roof to compare with this guide or email to a qualified professional for an expert opinion.

2. Is the roof less than 3m above the floor and covered with a suspended ceiling?

    If yes, it may be possible to access the roof by following the guidance in *Safe use of ladders and stepladders. A brief guide from the Health and Safety Executive, removing a ceiling panel and viewing the underside of the roof*.

3. What type of suspended ceiling is present?

    Use the *Best Practice Guide - Maintenance and access into suspended ceilings from the Finishes and Interiors Sector (FIS)* to identify the type of ceiling panel used; some can be accessed easily, while others require specialist input.

4. Is the roof so high that access equipment will be needed to see the surface clearly?

    If yes, engage an appropriately qualified person to access the roof

Inspecting the Roof

How to inspect a roof safely

If the roof is hidden by a suspended ceiling, you will need to gain access to the ceiling void or remove at least part of the suspended ceiling. Before attempting this, you should consult the school's asbestos register to make certain that the ceiling void does not contain asbestos.

Asbestos

Take particular care when inspecting a roof or ceiling void due to the possible presence of asbestos-containing materials. Before breaking through plasterboard into a ceiling void, consult the asbestos register or arrange an asbestos survey if this has not been conducted previously.

Even if an asbestos register is available, suspended ceiling tiles may not have been lifted during the survey, and subsequent works in the ceiling void may not have been well managed, leading to the possibility of asbestos debris within the void.

RAAC panels may have been coated with artex. In this case, the panel should only be broken into by an asbestos professional under controlled conditions.

Further information about managing asbestos is available online from the Health and Safety Executive.

If you do not have sufficient experience to inspect the roof safely, you should engage an appropriate surveyor/contractor to carry out the inspection.

You (or the surveyor/ contractor) should undertake a risk assessment to plan how to carry out the inspection safely.

Inspecting a roof

To carry out a visual inspection you will need to look up at the roof from the floor below and take some photos. Expand the photos to get a close-up view of the roof surface and compare it with the photos in this guide, or email them to a structural engineer for an expert opinion.

If you can see a concrete surface, tap it with a hammer to identify whether it is normal heavyweight concrete or lightweight RAAC. Normal concrete sounds solid and hard when tapped. RAAC feels much softer. If the panels do not have a coating, try to push a small screwdriver or nail into the material. A screwdriver will not penetrate normal concrete, but

will make a small hole in RAAC. If there is a coating, do not make a hole – the coating may contain asbestos.

Do not go up onto the roof, particularly if there is no safe means of access, such as a staircase, or there are no guardrails around the roof perimeter.

If there is a suspended ceiling and the panels are relatively light and can be lifted up and moved to one side to expose the ceiling void, follow the FIS guide. Use a torch to view the underside of the roof and take photos. Do not touch or disturb any of the materials in the ceiling void.

What should I do next?

Follow the steps in the attached flowchart, recording briefly the action taken, and in summary:

	If you are confident that your roof is one of the common forms of non-RAAC construction outlined in this guide in Annex A, no further action is required.
	If you think your roof may be constructed of RAAC planks, or you are not sure what the form of construction is, you should arrange an inspection/assessment. That is the responsibility of the building owner. If there are plans for an asbestos survey, this can be a good opportunity to check for RAAC planks at the same time. It would also be worth ensuring that any routine condition survey specifically covers RAAC. **If the presence of RAAC roof planks is confirmed, remedial work may be required. Your structural engineer will be able to advise on the level of risk, and scope and costs of any necessary work, based on their survey and assessment.**

Further information

Further information about RAAC and guidance on undertaking investigations and inspections is available in the following documents:

1. Structural-Safety (2019) *SCOSS Alert: Failure of reinforced autoclaved aerated concrete (RAAC) planks*
2. Institution of Structural Engineers (2008) *Guide to surveys and inspections of buildings and associated structures,* London: IStructE Ltd
3. Royal Institution of Chartered Surveyors (2010) *Building Surveys and Technical Due Diligence of Commercial Property* (4th ed.), London: RICS
4. *The Management of Health and Safety at Work (Amendment) Regulations 2006*
5. *The Construction (Design and Management) Regulations 2015*

Annex A: Types of Roof

Victorian/Edwardian roofs	 	Victorian or Edwardian buildings are typically built of red brick, have decorative features such as lintels and chimneys, and tiled roofs which are high-pitched or vaulted. The principal trusses (the roof's supporting framework) will be made of timber or steel and spaced around 3–6m apart. These may be visible, but might also be hidden behind modern suspended ceiling tiles. Example of Victorian/Edwardian school roof – images from David Robertson
Modern roofs with timber trusses		Modern roofs may have closely spaced timber trusses which can be accessed through a loft hatch. These usually have a flat plasterboard ceiling and a pitched tiled roof. Example of modern timber truss – David Robertson
Roofs with timber joists and plywood decking	 	These are flat roofs supported by closely spaced horizontal timber joists at regular intervals. The underside will often have been covered with plasterboard, while there may be a plywood or strawboard deck over the top. Small joists are sometimes used to form a suspended ceiling below the actual roof, so you should confirm the presence of plywood decking by accessing the roof void. Example of plasterboard ceiling opened to reveal joists and timber decking – David Robertson

Crinkly tin roofs		These roofs have a shiny or painted wavy metal deck, which is usually supported on steelwork. The metal deck may be perforated. In schools these will often be hidden behind a suspended ceiling. The top side of the roof will sometimes have been infilled with concrete or insulation and covered in a waterproof layer. Example of crinkly tin roof – Khan Thorne
In situ concrete roofs		An *in situ* concrete roof is one where the concrete was poured on site. They are usually flat and the underside of the concrete is likely to have been plastered and painted. It may also be covered by a suspended ceiling. These roofs have a very solid feel with rebound when tapped with a hammer.
Solid precast concrete roofs		These roofs are made of concrete panels spanning between beams or onto walls. The width of the panels varies from around 250mm to 2m. As with in situ concrete roofs, they may have been plastered and painted, but could also be hidden behind a suspended ceiling. The concrete has a dense surface texture and a very solid feel with rebound when tapped with a hammer. Example of precast concrete roof – image from FP McCann brochure
Concrete beam-and-block roofs		These roofs are made of concrete beams, typically 440mm apart (the length of a concrete block), spanning between walls or onto supporting beams. The space between the beams will be filled with concrete blocks. The blocks may be aerated or 'bubbly', but will not be made of RAAC. The roof may have been directly plastered or could be hidden behind a suspended ceiling. These roofs are easy to identify by looking for the blocks between beams, but the plaster might need to be removed if they have been

		decorated. Example of beam-and-block roof – image from Matrix Precast Concrete website

Acknowledgements

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