Rapid projects support government departments to understand the scientific evidence underpinning a policy issue or area by convening academic, industry and government experts at a single roundtable. These summary meeting notes seek to provide accessible science advice for policymakers. They represent the combined views of roundtable participants at the time of the discussion and are not statements of government policy.

" What are the priority research questions for enabling a risk-based approach to Reinforced Autoclaved Aerated Concrete (RAAC) in the built environment?"
Meeting notes from roundtable chaired by Russell Viner (Chief Scientific Adviser at Department for Education), facilitated by Government Office for Science.
10th November 2023

Purpose

The discussion was focused on research questions that would directly enable a risk-based approach to 'living with RAAC' across the built environment. This included:

1. Understanding what new research is already underway to avoid duplication of effort, and
2. Agreeing a prioritised research agenda for tackling relevant evidence gaps about RAAC, such as the viability of non-invasive testing methods and other potential mitigations.

There was a clear steer that the focus of this work was to identify priority research requirements, and to support operational management and decision making, in order to enable building managers to move quickly to mitigation/action. This would inevitably mean de-prioritising interesting but non-essential research in favour of being able to apply research to building management in the short term.

The general activities outlined below received strong support. It was agreed that some of these needed to be addressed simultaneously. A systems view of the problem is needed, which links data collection, identification methods and risk mitigation approaches.

It was also recognised that RAAC is just one of a number of building issues needing collective consideration.

Other activities were proposed at the meeting, including studying the deterioration of RAAC over time, the effects of climate on RAAC and conducting a "RAAC census". There was less consensus about prioritising such activities, given the instruction to prioritise the most urgent evidence gaps in relation to policy and operational needs, as well as time constraints and likely available funding.

1. RAAC panel data collection

This theme is split into two sections: one concerning sampling of an appropriate range of RAAC panels, with the other on ensuring damaged RAAC panels are collected and studied.

Note: In this document, "panel" covers both RAAC panels and planks.

1.1 Ensure sufficient sampling of RAAC panels from a range of environments/sectors to enable detailed laboratory study of known issues

There was consensus that there needs to be some form of RAAC data repository, but further thought is needed to determine what and how many data should be collected in an affordable way to achieve sufficient statistical power. The BSR (Building Safety Regulator) is currently carrying out some research to better estimate the prevalence of RAAC panels in the built environment. This work will be published when completed, but more detailed investigation is likely to be required of a sub-sample of panels.

Purpose:

- Aggregated analysis of the data sample will help to understand the proportion of RAAC that is at high risk of failure, which can inform a risk management approach.
- The ability to do detailed laboratory study on samples will further our knowledge of the performance/management/construction defects in RAAC panels across different sectors
- The analysis of the data samples can be incorporated into structural engineering software which in future could support safety assessment and design of risk mitigation measures.

Considerations:

- An appropriate sample of RAAC panels is needed from across different sectors (e.g. health, education): sample size likely to be in the thousands (further thinking required here).
- There would need to be a standardised data capture process, including appropriate anonymisation. Initial suggestions on data to cover were construction/installation methods and age, loading, adjacent materials, weather exposure and specific aspects of RAAC condition (e.g. spalling, corrosion). To be agreed in line with prioritisation.
- Commercial confidentiality needs to be considered, particularly where legal and insurance liabilities might be involved.

1.2 Gather and expand data on RAAC failure in real-world conditions

Expanding the limited data on failure modes would enable statistical analysis of failures as well as comparison with current accepted standards. This would improve risk assessments and enable authorities to prioritise actions based on this risk.

Purpose:

- The number of recorded failures is small (and the quality of available data on these failures is variable), limiting understanding of the key risks. It is important to get a better and more reliable catalogue of failure modes and contributing factors in the UK (and internationally if possible). It is worth investigating whether insurance companies hold incident records.
- A broader evidence base of 'failed' RAAC could inform inspection of similar panels if records exist of their usage and location, using the wider data repository where possible (see 1a).
- A range of organisations have already begun to collect some of these data (e.g. Mott MacDonald).

2. Continue to develop non-invasive techniques to identify RAAC and assess its risk of failure

Research should continue to develop scalable and affordable methods of identifying and risk-assessing RAAC using minimally invasive techniques (in addition to visual inspection) – to feed into wider data aggregation and inform operational decision making.

Purpose:

- Non-invasive inspection is necessary to identify the presence of RAAC and its properties without risking further damage to the property or harm to those inspecting, and to understand what interventions may be required for particular structures. Faster and cheaper inspection methods would accelerate knowledge of where RAAC is present and any risks it poses, enabling a more tailored approach to risk management and potentially improving continuity of building use.
- Non-invasive inspection would enable assessment of the condition and fitting of RAAC without risking (further) damage, including aspects such as the state of the concrete and position and state of the rebar.
- Non-destructive testing combined with an understanding of potential failure modes (see section 1) would enable improved risk assessment.

Considerations:

- Work is underway by MTC (Manufacturing Technology Centre) – currently funded by Innovate UK – to trial several commercially available methods
- Non-destructive testing (NDT) for safety/management purposes is different from NDT for research purposes. The former needs to be relatively simple to carry out and scalable.
- Research in this area should be coordinated and held in a single place to enable data aggregation. This will help to inform research on risk mitigation.

3. Study the effectiveness of risk mitigation approaches over time

It is important to understand the effectiveness of different risk mitigation methods, how this effectiveness changes over time, and the relative costs/benefits of continuous monitoring of RAAC versus proactive temporary mitigation (e.g. propping versus removal and replacement).

Purpose:

- To inform robust decision making on choices between extending the life of RAAC and removal of RAAC.
- There is a long history of RAAC mitigations since the 1990s, and it is important to understand how these mitigations have performed to inform decision making.
- As well as traditional RAAC mitigations, this research should look at putting innovative and potentially more cost-effective measures in place, such as concrete underpinning. This would enable existing measures to be scaled up and incorporated with new measures.

Considerations:

- Research needs to clearly assess the effectiveness of mitigation methods according to the type of failure mode identified.

- While a less urgent research question, it will be important to consider human factors such as optimising the skills and competencies of concrete inspectors.
- In many situations, putting mitigations in place to extend the life of RAAC was deemed to be a better use of resources in the shorter term, rather than relying on regular inspection or in-situ monitoring – at least until proven, practical and scalable NDT techniques are available to review a large number of panels at speed.
- A sampling approach would not give the confidence needed in many cases because of significant variability in the construction, installation and properties of RAAC panels.
- The insurance industry may again hold relevant data here.

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