Reinforced Autoclaved Aerated Concrete (RAAC): factsheet Q&A

Q: What is Reinforced Autoclaved Aerated Concrete (RAAC)?

- RAAC is a steel reinforced, highly aerated lightweight cementitious material. As it contains no coarse aggregate it has different material properties to conventional concrete.
- In the UK, RAAC was typically used in precast panels in walls, roofs and sometimes floors. Although RAAC was withdrawn from British design standards in 2001, it is still manufactured and installed all over the world. The product is covered by the European Standard BS EN 12602 (2016).

Q: Why is RAAC considered a safety risk?

- The Institution of Structural Engineers (IStructE) has noted that problems associated with older forms of construction using RAAC include high deflection, corrosion and spalling, and, where there is a low-end bearing, the possibility of sudden collapse.
- In 2020, the results from a survey were published by SCOSS that revealed RAAC beams suffered noticeably from water ingress, cracking, spalling and surface corrosion. In September 2022, the Office of Government Property issued a 'Safety Briefing Notice' which advised structural assessments should be carried out on buildings containing RAAC.
- Professor Chris Goodier, an expert in Construction Engineering and Materials at Loughborough University, has highlighted the principal issues: "It is RAAC from the 1950s, 60s and 70s that is of main concern, especially if it has not been adequately maintained. RAAC examples have been found with bearings (supports) which aren't big enough, and RAAC with the steel reinforcement in the wrong place, both of which can have structural implications. Prolonged water ingress (not uncommon on old flat roofs) can also lead to deterioration.

Q: How widely used is RAAC in the UK?

- RAAC was commonly used in construction from the 1950s until the 1980s. Being light, robust and cost-effective as well as having good thermal performance, it was popularly used in part because it was quick to manufacture and install.
- As a result, RAAC may therefore be found in school, college and other buildings that were either built or modified in this time period. It is predominantly found as precast panels in roofs due to its weight-saving benefits (commonly flat roofs, sometimes pitched) and occasionally in floors and walls.

Q: What are the differences between RAAC and traditional concrete?

- RAAC planks derive their structural strength from steel reinforcing bars and this reinforcement needs to be protected from water ingress. Where RAAC planks have been exposed to water over a prolonged period of time corrosion weakens the bars and hence the planks.
- Traditional concrete, precast or ready-mixed, is used with reinforcement, but this concrete is resilient to water ingress and protects the reinforcing bars. The IStructE notes that traditional concrete is a highly reliable material with high compressive strength, that when combined with steel reinforcement to become 'reinforced concrete', has the ability to form some of the world's biggest and heaviest loaded structures ranging from high-rise buildings to bridges, dams, and nuclear power stations.

Q: What are the differences between RAAC and aircrete products such as blocks?

- It is incorrect to draw comparisons between RAAC and the aircrete blocks used to build houses and low-rise commercial buildings, as these walling products do not use reinforcement.
- Modern aerated concrete building systems do not use reinforcing bars for structural performance. As a result, aircrete is not susceptible to the failures being seen in RAAC products manufactured from the 1950s to the 1980s that were predominantly caused by poor maintenance and installation rather than any issues or material faults with the aerated concrete.
- The British Standard for aircrete blocks is BS EN 771-4: 2011+A1:2015 - Specification for masonry units. Autoclaved aerated concrete masonry units.
- In 2008, BS EN 12602 - Prefabricated reinforced components of autoclaved aerated concrete, was first published and is specific to reinforced autoclaved aerated products. The current version of this standard is BS EN 12602:2016.

Q: When were issues with buildings constructed using RAAC identified?

- The first reports of potential safety-related issues of ageing RAAC appeared in the 1980s and 1990s. The Building Research Establishment published a report in 1996 that was funded by the Government which advised that RAAC panels in visually poor condition should be inspected annually.
- In 1999, the Standing Committee on Structural Safety (SCOSS) first recommended those responsible for buildings with pre-1980 RAAC to arrange inspections of those buildings using the material. Further guidance was published by SCOSS in 2019.

Q: What strategies are now available when RAAC planks are detected in a building?

- Not all RAAC panels present a risk and therefore the strategy adopted will depend on the condition of the plank. In some cases it may be appropriate not to physically do anything and to monitor the situation.
- Where there are concerns about the ends of the planks it may be possible to mitigate these by extending the support with steel angles, for example. Ultimately, if the risks are substantial and the condition severely degraded it may be necessary to replace the RAAC plank.
- The IStructE has provided guidance to support the identification, removal or strengthening of existing RAAC which includes solutions for remedial works that do not require an entire rebuild of the structure.

Q: What is the UK concrete industry doing to address concerns about RAAC?

- The UK concrete industry is clear that the first priority must be the continued identification of unsafe RAAC and then the rebuilding of these affected buildings. To help support the industry response, UK Concrete and the Mineral Products Association (MPA) are currently sharing our expertise and providing guidance to the Construction Leadership Council's (CLC) RAAC Industry Response Group.
- It's important to remember that when in a good condition and installed with correct bearing, RAAC is considered safe. However, if not properly maintained the panels can deteriorate over time, and this can be exacerbated by water ingress, posing a risk when insufficient bearing and structural integrity is compromised.
- The UK Government is aware of the issues, particularly across its own assets and the wider public sector, and has introduced a programme to remove or strengthen RAAC where necessary. The IStructE has advised that any private asset owner, with properties constructed between the mid-1950's and mid-1990's conduct a survey of the building to identify or eliminate the possibility of RAAC within the fabric where necessary.

Q: How can we be confident in all concrete – do we need to be worried about other types of concrete?

- There is no need to worry. Concrete is the world's most versatile and reliable man-made material and forms the foundation and fabric of our built environment, both onshore and offshore, above ground, on the ground, and below our feet. New homes, schools, hospitals, workplaces, roads and railways, as well as the infrastructure that provides us with clean water, sanitation and energy, all need concrete.
- The issues with RAAC today are sadly due to a failure in policy to support replacement and reconstruction of ageing buildings that have been neglected and poorly maintained. Where buildings are being properly looked after, we are increasingly seeing the reuse and repurposing of structures to extend their lives which in turn saves carbon and materials. Concrete's strength and durability is key to enhancing longevity in our built environment, which is an essential part of a future circular economy and will be important for unlocking greener, more sustainable assets and infrastructure.

Q: Are there risks associated with newer types of concrete materials?

- There are extensive and robust processes in place that manage the risks associated with the update to highly regulated design and product standards, which are evolving all of the time. These standards rely on rigorous test data together with modelling which are informed by in-use performance.
- New developments in multi-component concretes to produce lower carbon concretes have been through these processes and represent an important evolution of the British Standard for concrete, BS 8500. This update to BS 8500 is set to launch this autumn after extensive testing, consultation and approval from the British Standards Institution (BSI).
- It's important that innovation is not stifled in a climate emergency as product development is part of the solution to achieving more sustainable concrete and reducing carbon emissions across our UK built environment.

The Mineral Products Association (MPA) is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, industrial sands, lime and mortar industries.

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