

Recycled Concrete Aggregates

Fact sheet

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Acknowledgment of Country

We acknowledge that Aboriginal and Torres Strait Islander peoples are the First Peoples and Traditional Custodians of Australia, and the oldest continuing culture in human history.

We pay respect to Elders past and present and commit to respecting the lands we walk on, and the communities we walk with.

We celebrate the deep and enduring connection of Aboriginal and Torres Strait Islander peoples to Country and acknowledge their continuing custodianship of the land, seas and sky.

We acknowledge the ongoing stewardship of Aboriginal and Torres Strait Islander peoples, and the important contribution they make to our communities and economies.

We reflect on the continuing impact of government policies and practices, and recognise our responsibility to work together with and for Aboriginal and Torres Strait Islander peoples, families and communities, towards improved economic, social and cultural outcomes.

Artwork:

Regeneration by Josie Rose



FACT SHEET: Recycled Concrete Aggregates (RCA)

Recycled Concrete Aggregates

Recycled concrete aggregate (RCA) is coarse aggregate produced by crushing sound, clean demolition waste. Other materials that may be present in RCA are gravel, crushed stone, hydraulic-cement concrete or a combination thereof deemed suitable for premix concrete production.

Suitable use: Structural concrete (up to 50 MPa)¹, non-structural concrete, concrete pavement, pavement base and subbase.

Benefits

- Conserves use of natural resources
- Protecting the environment from further degradation

Considerations

Properties

- Lower specific gravity and therefore produce concrete with lower bulk density.
- Higher water absorption.
- Normal ASR reactivity, especially when combined with supplementary cementitious materials (SCMs).
- Possible excessive sulfate and chloride content due to the exposure conditions of the recycled concrete.

Mechanical performance

- Compressive strength can be improved with optimised mix design and suitable RCA quality control measures.
- Negative impacts on tensile strength and Young's modulus can be minimised with mix design.

Durability

- Can impact carbonation resistance, but additional cover or coating can mitigate the risk.
- Can increase shrinkage cracking, but optimised mix design can mitigate the risk.
- Can increase sulfate attack, which can be mitigated with supplementary cementitious materials.
- Can increase concrete abrasion, which can also be mitigated with supplementary cementitious materials as they reduce the porosity of concrete.

Program

- Requires early engagement with supplier to ensure availability.

¹ For structural concrete applications approval from Superintendent or Project Delivery Authority will be required for mixes that incorporate reused or recycled materials. For concrete with recycled materials, it is recommended that the mix performance, such as workability, compressive strength development, drying shrinkage, chloride diffusion coefficient, alkali aggregate reaction test reports, be reviewed prior to its application. Quality control of concrete being supplied for crushed aggregate needs to be carefully managed.

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Implications

Designer/ Specifier

- Designer to consider exposure conditions (high and low risk applications).
- BAU for non-structural.
- For structural application, AS5100 and AS3600 are silent, however there is no restriction to the application.
- Precasters might not be able to accommodate mixes with RCA).

- Specifier to understand performance requirement (i.e., early age strength).

Construction team

- Can decrease pumpability and finishability, but impact can be minimised with adequate mix design.

Application

The below table outlines the application of recycled concrete aggregates (RCA) in concrete in NSW.

RCA mixes	Replacement levels	
	Business as usual	Recommended For Projects
	5% in metropolitan areas	Up to 20% for structural applications Up to 30% for non-structural or temporary works
Observations	<ul style="list-style-type: none"> • No impact on performance requirements for concrete up to 50MPa. 	<ul style="list-style-type: none"> • For concrete up to 50MPa, strength targets can be achieved with optimised mixes. • Cost neutral if no special requirements (i.e., early strength, low shrinkage, low permeability) are needed.
Implementation actions	<ul style="list-style-type: none"> • Contact supplier for availability in regional areas. • No extra actions are required. 	<ul style="list-style-type: none"> • Include replacement levels in concrete specification. • Engage with local suppliers four months in advance in order for them to identify if trials are required and to ensure local plants have facilities to accommodate requirements. • Authority approval might be required for structural elements. • Inform construction team on possible impact on pumpability and potential more difficulty achieving a high-quality surface finish.

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