Recycled Concrete Aggregates

This factsheet advises on the use of recycled demolition waste in concrete aggregates.

Recycled concrete aggregates

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

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

Approval from a Superintendent/Principal or Project Delivery Authority must be obtained for structural concrete applications that incorporate reused or recycled materials. For concretes with reused and recycled materials, mix performance should be reviewed prior to its application, to determine its workability, compressive strength development, drying shrinkage, creep, chloride diffusion coefficient, and alkali aggregate reaction. Quality control of concrete being supplied for crushed aggregate must be carefully managed.

Benefits of recycled concrete aggregates

- Conserves the use of natural resources.
- Helps protect the environment from further degradation.

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Considerations for recycled concrete aggregates

Properties

- Lower specific gravity and therefore produces 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.

Implications for recycled concrete aggregates

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 finish ability, but impact can be minimized with adequate mix design.

Application

This table outlines the application recommendations of 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	No impact on performance requirements for concrete up to 50MPa.	• 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	• Contact supplier for availability in regional areas. • No extra actions are required.	• Include replacement levels in concrete specification. • Engage with local suppliers four months in advance to determine 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 difficulty achieving a high-quality surface finish.