REDUCING THE CARBON FOOTPRINT OF CONCRETE

Concrete is the most widely used building material in the world, but it is also one of the larger contributors to the carbon footprint of modern buildings. BRANZ partnered with Concrete NZ on expert research that has promising findings for the manufacture of lower-carbon concrete.

Concrete has been poured into buildings for centuries and is still a staple building material today. Its challenge is the generation of large volumes of greenhouse gas emissions in the manufacture of its traditional binding agent, Portland cement.

To reduce this carbon footprint, Portland cement is being substituted abroad with materials that have lower embodied carbon. Use of these supplementary cementitious materials (SCMs) can result in environmental benefits, improved performance and cost advantages.

In countries with larger heavy industry, SCMs recycled from industrial production include blast-furnace slag, fly ash and silica fume. Here in New Zealand, the sector has been assessing the potential of natural materials instead. These include volcanic glass, pozzolans from ash, silica and pumice from volcanic regions.

Another hurdle has been the lack of a reliable test for predicting the strength and durability of concrete incorporating different types and quantities of natural SCMs – essential for designers and contractors. Research by the University of Canterbury with funding from Concrete NZ and BRANZ has addressed this. Researchers investigated test methods and materials, comparing performance with international norms and standards.

Results released this year are promising. Concrete with SCMs can take longer to gain compressive strength, but replacement of 30 percent Portland cement with SCMs can achieve reasonable strength and superior durability properties in some cases. Crucially, results showed this could reduce embodied carbon by as much as 20 percent.

> *"The results from this Concrete NZ and BRANZ research project into supplementary cementitious materials will play a hugely important role in the New Zealand concrete industry achieving its net-zero carbon objectives by 2050."*
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> ROB GAIMSTER, CHIEF EXECUTIVE OFFICER, CONCRETE NZ

With estimated current SCM replacement in New Zealand below 10 percent, these findings should help overcome a major technical barrier to greater adoption.

Researchers recommend revising the current standard relating to SCMs in concrete and adopting an alternative classification system to assess performance. This should lead to increased use of SCMs and – ultimately – lower embodied carbon in concrete in the built environment.

READ MORE

» BRANZ External Research Report ER66 (2021) *Removing the barriers to the use of significant levels of SCMs in concrete production in New Zealand*