

# BUILDgreen

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# SUSTAINABLE CONSTRUCTION: RCA FOR STRUCTURAL APPLICATIONS



Dr Ho Nyok Yong

**DR HO NYOK YONG, DIRECTOR OF SAMWOH CORPORATION, DISCUSSES THE CHALLENGES OF CONSTRUCTING THE SAMWOH ECO-GREEN BUILDING USING CONCRETE WITH 100% RECYCLED CONCRETE AGGREGATES.**

**Question:** Is it true that recycled concrete aggregates (RCA) are inferior in quality compared to natural aggregates making them only suitable for non-structural works?

**Dr Ho:** In general, there is a lack of confidence in the quality of RCA and consequently, its application in structural concrete. Quality in RCA is highly determined by the existence of proper and stringent control in the RCA quality during processing. With few projects adopting RCA in structural building works previously might also contribute to the slow rising numbers of using RCA for structural applications.

**Question:** Could the cost of RCA as compared to natural aggregates be a deterrent factor?

**Dr Ho:** The cost is not one of the deterrent factors for the use of RCA in structural application. In fact, the price of RCA has been very competitive as compared to natural aggregate. We are optimistic that there will be more projects adopting RCA in structural building works with the many schemes such as Green Mark scheme put in place by BCA to encourage industry stakeholders.

**Question:** What are the challenges faced when undertaking Samwoh Eco-Green Building project? How did you overcome them?

**Dr Ho:** The studies on the use of RCA in concrete were not new then, but they are mostly confined to laboratory scale and limited literature was available. As such, the practicability of using RCA concrete and its performance in actual building were uncertain and doubtful. Even though the BS EN standard has already allowed 20% replacement of RCA in structural concrete, there are concerns on the possible adverse impacts.

We managed to address the various issues through extensive laboratory tests to evaluate the material properties such as permeability and creep of concrete. We also implemented advanced structural monitoring device like the fibre-optic sensors in key structural elements in columns to monitor the actual behaviour of the building. These initiatives were made possible by the support from the MND Research Fund administrated by BCA. Now, Samwoh Eco-Green Building stood strong and became the first building in the region to achieve up to 100% replacement of RCA in structural concrete works, which has effectively demonstrated the feasibility of using high percentage of RCA in structural concrete and to further boost the confidence of the industry.

**Question:** What are some of the features that help Samwoh Eco-Green Building to achieve low concrete usage index?

**Dr Ho:** We have achieved a good concrete usage index value of 0.33 for the building. Although concrete with RCA was used for the key structural elements – which included columns, beams, slabs, lift cores and staircase cores – the internal non-structural walls were constructed using dry walls and hollow-core walls made of fine RCA. For the building façade, a special type of perforated aluminium curtain wall was used to reduce the heat and allow natural daylight to enter the building.

**Question:** Moving forward, are you planning any research and development activities for green concrete?

**Dr Ho:** Samwoh has been relentlessly looking into the feasibility of using different types of recycled wastes for construction applications even before sustainable development took flight in Singapore. The efficient utilisation of coarse RCA in structural concrete is definitely not an end to our sustainable journey but an opening to a new chapter. Moving forward, we will explore other potential wastes that can be recycled from the waste stream.

