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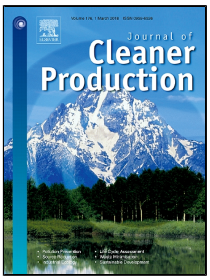

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Variability of stress-strain relationship for recycled aggregate concrete under uniaxial compression loading

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Abstract

Uniaxial compression loading tests were carried out to investigate the variability in stress-strain relationship of recycled aggregate concrete (RAC) due to intrinsic variability in properties of recycled coarse aggregates (RCAs). RCAs were selected from a single source to minimize the effects of potential variations in properties of waste concrete. Natural aggregate concrete (NAC) and RAC prisms were designed with different RCA replacement ratios but similar compressive strength. The results show that the RAC prisms have a similar failure pattern with that of NAC specimens. The RAC specimens were however found to have a lower elastic modulus and a higher peak strain. The variability of the peak stress, peak strain, elastic modulus and ultimate strain was found to follow a normal distribution. Based on the collected experimental data, a modified RAC stress-strain model was proposed. The RAC was found to possess a bit more brittle properties than NAC, as indicated by the steeper stress-strain curve's descending branch for the RAC. The variability of RAC stress-strain model was evaluated and the corresponding probability density function (PDF) and cumulative distribution function (CDF) were discussed.

Keywords: Recycled aggregate concrete (RAC); stress-strain relationship; variability; probability density function (PDF); uniaxial compression loading; normal distribution.

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