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Discussion

Discussion of the paper "Models relating mixture composition to the density and strength of foam concrete using response surface methodology" by E.K. Kunhanandan Nambiar and K. Ramamurthy ☆

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The authors presented very interesting results and ideas on the use of various materials in cellular concrete. To add to the value of their findings, this discussion points out interesting similarities with the findings obtained from a previous study [2]. That study utilized a very similar experimental design approach to develop cellular concrete mixtures using a specific set of materials including a natural lightweight sand (LWS). The experimental region explored was at higher concrete densities (fresh concrete densities of 1200–1800 kg/m^3 which is estimated to correspond with 1000–1600 kg/m^3 dry densities) and the testing was performed with 2 m^3 concrete mixtures in ready-mix trucks. In spite of the significant differences in materials, density space studied and mixing method, it is very interesting that the predictive equation for the effect of air or foam on the 28-day compressive strength presented in the article is practically the same as the one obtained by Rodriguez et al. In the following equations, FV is the foam volume, and F/C is the filler-cement ratio (which also appears in the Kunhanandan and Ramamurthy equation):

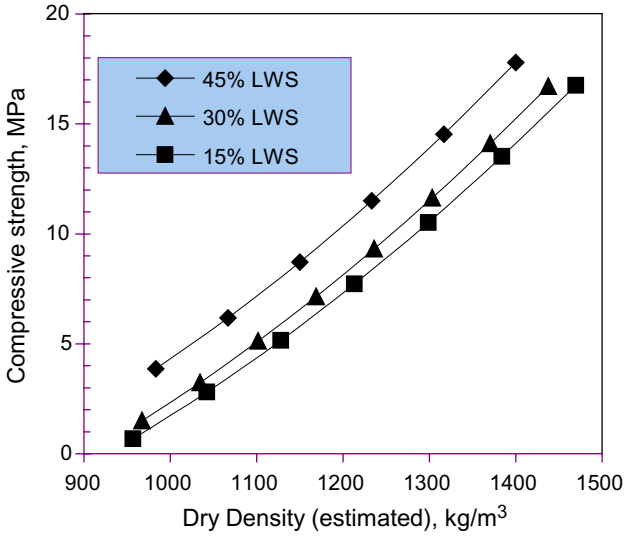

Fig. R1. Predicted strength–density relationship at constant cement content and w/c and various levels of light weight sand (LWS) (Rodriguez et al. model).

Equation from article with F/C = 0 (Kunhanandan and Ramamurthy):	28-day strength (MPa) = 32.342 − 1.004 FV + 0.00768 FV^2
Equation by Rodriguez et.al.:	28-day strength (MPa) = 34.6 − 1.11 FV + 0.0082 FV^2

Given the differences in the experimental design it is difficult to directly compare the two models regarding the effect of other variables. However, the general trend of increase strength of cellular concrete by replacing sand with a lighter weight material, shown in Fig. 6 of the paper, is similar to the attached figure, Fig. R1, obtained with the Rodriguez et al. model. These two figures show that at a fixed density, incorporation of either low density fly ash

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or lightweight aggregate increases the strength of cellular concrete as both reduce the foam content. Combination of these two approaches may allow further compressive strength enhancement of cellular concrete.

References

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