

Effect of mix proportions on plastic shrinkage cracking of concrete in hot environments

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Abstract: The effect of mix proportions, i.e. cement content and water-cement ratio, on plastic shrinkage cracking of concrete in hot and arid environments was investigated. The cumulative effect of these parameters on plastic shrinkage of concrete was assessed by measuring the rate of bleeding, water evaporation, and time and intensity of cracks. The results indicated that cement content and water-cement ratio significantly affect the parameters controlling plastic shrinkage of concrete. Lean-stiff concrete mixes cracked earlier than the rich-plastic concrete mixes. The intensity of cracks in the former was, however, less than that in the latter. Plastic shrinkage cracking occurred when the rate of evaporation was in the range of 0.2-0.7 kg m⁻² h⁻¹, as against a value of 1 kg m⁻² h⁻¹ suggested by ACI 305. The rate of evaporation and bleeding was the least in a lean-stiff concrete mix made with a cement content of 300 kg m⁻³ and a water-cement ratio of 0.40, indicating that this mix composition can be beneficially utilized in hot environments to minimize plastic shrinkage cracking. © 1998 Elsevier Science Ltd. All rights reserved.