

Effect of Fresh Concrete Curing Methods on Its Compressive Strength

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Abstract : Concrete is one of the most used construction materials that may be made onsite as fresh concrete and then placed in formwork to produce the desired shapes of structures. It has been recognized that the raw materials and mix proportion of concrete dominate the mechanical characteristics of hardened concrete, and the curing method and environment applied to the concrete in early stages of hardening will significantly influence the concrete properties, such as compressive strength, durability, permeability etc. In construction practice, there are various curing methods to maintain the presence of mixing water throughout the early stages of concrete hardening. They are also beneficial to concrete in hot weather conditions as they provide cooling and prevent the evaporation of water. Such methods include ponding or immersion, spraying or fogging, saturated wet covering etc. Also there are various curing methods that may be implemented to decrease the level of water lost which belongs to the concrete surface, such as putting a layer of impervious paper, plastic sheeting or membrane on the concrete to cover it. In the concrete material laboratory, accelerated strength gain methods supply the concrete with heat and additional moisture by applying live steam, coils that are subject to heating or pads that have been warmed electrically. Currently when determining the mechanical parameters of a concrete, the concrete is usually sampled from fresh concrete on site and then cured and tested in laboratories where standardized curing procedures are adopted. However, in engineering practice, curing procedures in the construction sites after the placing of concrete might be very different from the laboratory criteria, and this includes some standard curing procedures adopted in the laboratory that can't be applied on site. Sometimes the contractor compromises the curing methods in order to reduce construction costs etc. Obviously the difference between curing procedures adopted in the laboratory and those used on construction sites might over- or under-estimate the real concrete quality. This paper presents the effect of three typical curing methods (air curing, water immersion curing, plastic film curing) and of maintaining concrete in steel moulds on the compressive strength development of normal concrete. In this study, Portland cement with 30% fly ash was used and different curing periods, 7 days, 28 days and 60 days were applied. It was found that the highest compressive strength was observed from concrete samples to which 7-day water immersion curing was applied and from samples maintained in steel moulds up to the testing date. The research results implied that concrete used as infill in steel tubular members might develop a higher strength than predicted by design assumptions based on air curing methods. Wrapping concrete with plastic film as a curing method might delay the concrete strength development in the early stages. Water immersion curing for 7 days might significantly increase the concrete compressive strength.

Keywords : compressive strength, air curing, water immersion curing, plastic film curing, maintaining in steel mould, comparison

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