

Study of the increased deflection of reinforced concrete beam with time^{*}

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Abstract

Long-term deflections of reinforced concrete beams due to creep and shrinkage of concrete may be significant, especially for cracked beams, and can cause damage in structural and nonstructural elements, so they must be accurately estimated at the design stage.

Creep and shrinkage of concrete are influenced by environmental conditions, the size of the element, the water/cement ratio, the type of cement, and the relative humidity. Creep also depends on the level of applied stress, on the duration of the sustained load and on the age of concrete at the instant of loading. In addition, deflections due to creep and shrinkage depend on the cracking level, on the amount of compressive steel, on the geometry and support conditions of the structure and on the construction sequence, among other factors.

The accurate prediction of deflections is a complex problem which requires the use of non-linear and time-dependent analytical methods. These methods are, in general, time consuming and require great effort. However, at the design stage, simple but reliable methods which take into account the most important parameters influencing the long-term deflections may be very useful to adequately design the structure.

For that purpose, many simplified methods have been developed [1-2-3-4-9], Equations has been programmed to access the method combining the simplicity and accuracy and providing valuable information about the influence of each parameter on the increasing deflections with time. Also, the results of the proposed method fit very well the results of laboratory experiments previously done [8].

It is concluded that, this model could be used to accurately predict the deflections at any time of the service life of normal and high strength concrete structures, loaded at any age.

Keywords: Reinforced concrete beams, Deflections, Time, Creep, Shrinkage, Compressive Reinforcement.

For the abstract in Arabic see pages (129-142).

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