

CODE

24.2.4 Calculation of time-dependent deflections**24.2.4.1 Nonprestressed members**

24.2.4.1.1 Unless obtained from a more comprehensive analysis, additional time-dependent deflection resulting from creep and shrinkage of flexural members shall be calculated as the product of the immediate deflection caused by sustained load and the factor λ_{Δ}

$$\lambda_{\Delta} = \frac{\xi}{1 + 50\rho'} \quad (24.2.4.1.1)$$

24.2.4.1.2 In Eq. (24.2.4.1.1), ρ' shall be calculated at midspan for simple and continuous spans, and at the support for cantilevers.

24.2.4.1.3 In Eq. (24.2.4.1.1), values of the time-dependent factor for sustained loads, ξ , shall be in accordance with Table 24.2.4.1.3.

Table 24.2.4.1.3—Time-dependent factor for sustained loads

Sustained load duration, months	Time-dependent factor ξ
3	1.0
6	1.2
12	1.4
60 or more	2.0

COMMENTARY

A method for predicting the effect of nonprestressed tension reinforcement in reducing creep camber is also given in [Shaikh and Branson \(1970\)](#), with approximate forms given in [ACI 209R](#) and [Branson \(1970\)](#).

R24.2.4 Calculation of time-dependent deflections**R24.2.4.1 Nonprestressed members**

Shrinkage and creep cause time-dependent deflections in addition to the elastic deflections that occur when loads are first placed on the structure. Such deflections are influenced by temperature, humidity, curing conditions, age at time of loading, amount of compression reinforcement, and magnitude of the sustained load. The expression given in this section is considered satisfactory for use with the Code procedures for the calculation of immediate deflections, and with the limits given in Table 24.2.2. The deflection calculated in accordance with this section is the additional time-dependent deflection due to the dead load and those portions of other loads that will be sustained for a sufficient period to cause significant time-dependent deflections.

Equation (24.2.4.1.1) was developed in [Branson \(1971\)](#). In Eq. (24.2.4.1.1), the term $(1 + 50\rho')$ accounts for the effect of compression reinforcement in reducing time-dependent deflections. $\xi = 2.0$ represents a nominal time-dependent factor for a 5-year duration of loading. The curve in Fig. R24.2.4.1 may be used to estimate values of ξ for loading periods less than 5 years.

If it is desired to consider creep and shrinkage separately, approximate equations provided in [Branson \(1965, 1971, 1977\)](#) and [ACI Committee 435 \(1966\)](#) may be used.

Because available data on time-dependent deflections of two-way slabs are too limited to justify more elaborate procedures, calculation of the additional time-dependent deflection for two-way construction in accordance with Eq. (24.2.4.1.1) is required to use the multipliers given in 24.2.4.1.3.

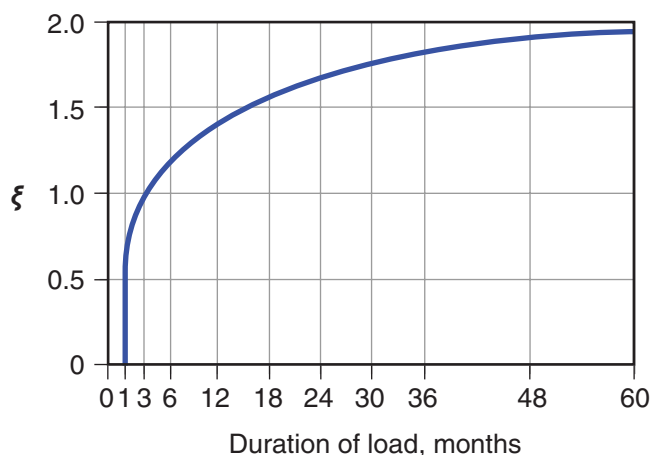


Fig. R24.2.4.1—Multipliers for time-dependent deflections.