

Appendix XXIV

Superstructure Cracking Analysis for the Prestressed Concrete Girder Bridge

f_c' of the slab = 30 N/mm² = 4351 psi [Maday, 2002].

The cracking stress of the slab:

$$f_r = 7.5\sqrt{f_c'} = 7.5\sqrt{4351} = 495 \text{ psi} = 3.41 \text{ MPa}$$

After applying the 82-N/mm uniformly distributed load (the equivalent earthquake force using the uniform load method from section 3.15.1) along the superstructure, the maximum stress in the superstructure was calculated:

$$\sigma_a = \frac{M_a y}{I_{yy}}$$

σ_a = maximum stress in the superstructure

M_a = maximum moment in the superstructure

y = distance from the y-y axis to the most extreme point of the superstructure (edges of the slab)

I_{yy} = Moment of inertia of the superstructure about the y-y axis

$$\sigma_a = \frac{(1.36 \times 10^{10} \text{ Nmm})(12550 \text{ mm})}{4.69 \times 10^{14} \text{ mm}^4} = 0.365 \text{ MPa}$$

$\sigma_a < f_r$, thus the superstructure was not cracked during the maximum considered earthquake.