

Corrosion cracking in relation to bar diameter, cover, and concrete quality

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Abstract: Concrete cover, concrete quality, and bar size have a significant effect on corrosion initiation and corrosion cracking. This paper attempts to quantify the effect of these three parameters in providing corrosion protection to reinforcing steel. It is found that the cover-to-bar diameter (c/d) ratio is a more definitive protection parameter against corrosion cracking than either cover or bar diameter separately. In view of the importance of c/d ratio, clear cover specifications without consideration of the bar size leads to inadequate and misleading design for corrosion protection, especially in concrete where internal chlorides are present in concrete from the time of manufacturing, making the corrosion propagation time prior to cracking an important phase in the service life of structures. A concept of corrosion cracking resistance factor, $cf'c/d$ or c/dw incorporating cover, bar diameter, and concrete quality either in terms of strength ($f'c$) or water-cement ratio (w) has been developed to quantify the relative corrosion protection provided by a particular set of detailing and strength parameters.