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Reliability-Based Design for the Flexural Capacity of Fiber Reinforced Concrete Slabs on Ground

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Abstract **-** The contribution of fibers in enhancing the mechanical behavior and providing a post-crack residual capacity of the concrete sections have widely been investigated and design approaches of fiber reinforced concrete (FRC) are established. These design approaches are usually uncertain and associated with inherent variability and modeling errors in which should be accounted for when designing reliable structures. The addition of fibers has further increased the range of uncertainties resulting in inconsistent levels of reliability for FRC structures when compared with those established for traditional reinforced concrete structures. To this end, this paper conducts a reliability-based analysis of the ultimate limit state (ULS) of the fiber reinforced concrete slabs (FRCS) on ground under flexural loading. The ULS is formulated based on the procedure adopted in the ACI 360R regarding the calculation of the post-crack moment capacity of fiber reinforced concrete slabs (FRCS) on ground under flexural loading. To ensure that the design procedure provides acceptable reliability levels, experimental results collected from previous studies were used in the statistical calibration. Monte-Carlo simulation was adapted to generate an array of random variables knowing their statistical parameters and distributions. Reduction factors for the flexural strength of FRC slabs corresponding to the load factors specified in the design codes were calculated and certain values are proposed to achieve target reliability levels.

Keywords**:** Reliability, reduction factor, variation, distribution, fiber reinforced concrete, fibers, ground slabs.