

ABSTRACT

Reinforcement corrosion poses a major threat to the durability and safety of concrete infrastructure, contributing to significant economic losses and structural failures worldwide. While the effects of reinforcement corrosion on the flexural strength and bond of reinforcement in non-prestressed (reinforced) concrete beams have garnered considerable attention from the research community, the impact on shear strength in non-prestressed slender beams with a shear span to effective depth ratio greater than 2.0 requires further investigation. Shear failures are typically sudden and catastrophic, underscoring the urgent need for a deeper understanding and more accurate assessment of the shear strength of reinforced concrete beams with reinforcement corrosion damage. Shear strength is particularly critical because stirrups, which provide shear resistance, are located close to the surface with minimal concrete cover, making them highly susceptible to corrosion. Additionally, the significant role played by longitudinal tension reinforcement on the shear strength attributed to the concrete in beams with and without stirrups is well-established. The impact of corrosion on this reinforcement also warrants careful examination in the case of beams subjected to shear.

This paper provides a critical review of the literature regarding experimental and analytical investigations into the behavior of one-way non-prestressed beams with a shear span to depth ratio greater than 2.0 under varying levels of reinforcement corrosion. Experimental findings from accelerated corrosion and load testing, focusing on the reduction in shear capacity, failure modes, changes in crack patterns, and load-deflection behavior, are reviewed. The ACI 318-25 shear design provisions are critically assessed through tests of beams with corrosion damage to reinforcement by comparing the experimental results with code-calculated strengths for those specimens, based on a database compiled from existing studies. The findings highlight the limitations of current models and propose modifications to enhance the accuracy of shear strength predictions for corrosion-damaged beams, which can provide valuable insights for the assessment and rehabilitation of aging concrete infrastructure.