The flexural behaviour of reinforced concrete beams containing SYCLAG has been studied experimentally and analytically. The flexural behaviour of beams made with SYCLAG concrete has been compared with that of control beams made with normal strength concrete. The flexural behaviour of SYCLAG beams has been found to be similar to that of normal concrete beams, with some slight differences in the stress-strain relationship and in the cracking pattern. The ultimate load of SYCLAG beams was found to be 98% of the ultimate load of control beams, and the deflection at maximum load was 79% of the deflection of control beams.

The flexural behaviour of SYCLAG beams has also been studied under fatigue loading. The experimental results showed that the remaining prestress after fatigue creep relaxation no longer closed the crack at the minimum load. When the load levels were such that the remaining prestress at the minimum load was still positive, the crack did not close at the minimum load. When the load levels were such that the remaining prestress at the minimum load was negative, the crack closed at the minimum load. The experimental results showed that the crack did not close at the minimum load when the load levels were such that the remaining prestress at the minimum load was negative.

The results of the experimental study showed that the flexural behaviour of SYCLAG beams is similar to that of normal concrete beams. The ultimate load of SYCLAG beams was found to be 98% of the ultimate load of control beams, and the deflection at maximum load was 79% of the deflection of control beams. The crack did not close at the minimum load when the load levels were such that the remaining prestress at the minimum load was negative.

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under eccentric loads is essential to understand the effect of this retrofitting technique on the performance of columns. The experimental data was then used to propose a simplified methodology that predicts the axial force-moment interaction diagram of fully grouted reinforced concrete masonry columns strengthened with FRP jackets. The methodology considers short prismatic reinforced concrete masonry columns failing in a compression controlled manner and complies with equilibrium and strain compatibility principles. To achieve this research goals, 47 scaled fully grouted concrete block masonry columns were tested under concentric, eccentric, and bending loading up to failure. Parameters investigated in this research include the thickness of CFRP jacket, corner radius of cross section, and the magnitude of eccentricity. The proposed analytical methodology showed a good correlation with the experimental data. Parametric study was carried out to determine the effect of design variables on the axial-flexural interaction of fully grouted reinforced concrete masonry columns strengthened by FRP jackets.