

Flexural Behaviour Of Reinforced Concrete Beam Containing

Basalt fibers have recently been introduced as a promising alternative to the existing fiber reinforced polymer (FRP) family. The mechanical properties of basalt FRP (BFRP) bars are, generally, better than those of glass FRP (GFRP) bars. However, they are still lower than those of carbon FRP (CFRP) bars. Also BFRP bars have now been developed that have a higher modulus of elasticity than typical GFRP bars. Only a limited amount of research is available on BFRP bars in structural concrete applications and there is no information on the performance of prestressed basalt bars in reinforced concrete elements subjected to fatigue loading. Most studies that are available deal only with the flexural behaviour of concrete beams reinforced with non- prestressed and prestressed GFRP and CFRP bars under monotonic and fatigue loading. This thesis presents an experimental study of the flexural behaviour of concrete beams reinforced with non-prestressed and prestressed basalt bars under monotonic and fatigue loading and compares these beam fatigue results with the fatigue behaviour of similar machined basalt rebars tested under fatigue loading in air. Sixteen beams with dimensions of (2400x 300x150mm) and thirteen BFRP bare rebars were tested. The parameters that varied were the level of prestress of the bars (0%, 20% and 40% of their static tension capacity) and the fatigue load ranges. The experimental findings showed a difference in the long life fatigue strength between the beams prestressed to 40% 20% and 0% of the bar strength with the beams with the bars prestressed to 40% of the bar strength showing a higher fatigue strength than of those prestressed to 0% and 20%. For 40% and 20 % prestressed beams, there is no benefit in fatigue performance above 20% and 13% of the ultimate capacity of the beams a level at which calculations showed that the remaining prestress did not close cracks at the minimum load in the fatigue load cycle. When compared on the basis of load range versus cycles to failure, the data for the three beam types fell onto a single curve at load levels where the remaining prestress after fatigue creep relaxation no longer closed the crack at the minimum load.

Flexural Behaviour of Reinforced Concrete Beams at Working Loads
Flexural Behaviour of Reinforced Concrete Members at Transient High

Temperatures
Flexural Behaviour of Reinforced Concrete Beams with
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Nonlinear Flexural Behaviour of Reinforced

Concrete Beams and Slabs [microform]
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Flexural Behaviour of Reinforced Concrete Slabs with Ferrocement Cover
Flexural Behaviour of Reinforced Concrete Slab
Tests to Determine the Flexural Behaviour of Reinforced Concrete Blockwork
Flexural Behaviour of Continuously Supported FRP Reinforced Concrete Beams
Flexural Behaviour of Reinforced Concrete Beam Using Partial Synthetic Lightweight Coarse Aggregate (SYLCAG)

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Confining existing concrete and masonry columns by Fibre Reinforced Polymers (FRP) is a beneficial method for enhancing the column capacity and ductility. The popularity of using FRP for strengthening and upgrading columns is mainly attributed to the high strength and lightweight characteristics of the FRP materials. Using FRP composites reduces additional dead load associated with traditional strengthening solutions and simplify the application in areas with limited access. The goal of this research is to experimentally quantify the enhancement in strength and strain capacity of Carbon FRP (CFRP) confined concrete masonry columns under concentric and eccentric loading. Research on FRP-strengthened concrete masonry columns 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 column 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 the 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 column strengthened by FRP jackets. Concrete is a global material that underwrites commercial wellbeing and social development. There is no substitute that can be used on the same engineering scale and its sustainability, exploitation and further development are imperatives to creating and maintaining a healthy economy and environment worldwide. The pressure for change and improvement of performance is relentless and necessary. Concrete must keep evolving to satisfy the increasing demands of all its users.

This dissertation, "Nonlinear Analysis of Reinforced Concrete Beams and Columns With Special Reference to Full-range and Cyclic" by Zhizhou, Bai, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. Abstract: Abstract of thesis entitled NONLINEAR ANALYSIS OF REINFORCED CONCRETE BEAMS AND COLUMNS WITH SPECIAL REFERENCE TO FULL-RANGE AND CYCLIC BEHAVIOUR Submitted by BAI Zhizhou for the degree of Doctor of Philosophy at The University of Hong Kong in December 2006 In this thesis, the full-range flexural behaviour of reinforced concrete (RC) beams and columns made of normal- and high-strength concrete under both monotonic and cyclic loading is studied. The full-range moment-curvature relationships are obtained based on a numerical method that considers the cyclic response of constitutive materials. A two-dimensional nonlinear finite element procedure is also developed

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for the analysis of RC beams under monotonic and non-reversed cyclic loading. For RC beam sections, it is found that the full-range flexural behaviour is basically dependent on the tension steel to balanced steel ratio. The full-range moment-curvature curves for under-reinforced sections have long yield plateaus while those for over-reinforced sections have sharp peaks. The full-range moment-curvature curves under monotonic loading in sagging and hogging moments are found to give the envelope for cyclic response. Reversed cyclic loading generally creates overall residual tensile strains in RC sections, and is especially significant for under-reinforced sections. The variation of neutral axis depth during monotonic and cyclic loading shows different trends for under- and over-reinforced sections. For RC column sections, it is found that the full-range flexural behaviour is strongly dependent on the axial load and confinement, which govern the moment capacity, ductility and failure mode of an RC column. The flexural ductility is generally reduced by compressive axial load but increased by confinement. The moment-curvature curve of a section under tensile axial load or relatively low compressive axial load has a long plateau around peak moment, while that under relatively high compressive axial load has a sharper peak. The complete moment-curvature curves under monotonic loading in sagging and hogging moments give the envelope for cyclic response except for sections under very high compressive axial load. A section under tensile axial load or low compressive axial load tends to elongate after a complete cyclic loading, while a section under high compressive axial load tends to shorten. The variations of neutral axis depth and steel stresses are also dependent on the axial load and confinement. The effect of concrete tensile strength is only notable for under-reinforced RC beam sections and for RC column sections under tensile axial load or relatively low compressive axial load at the service stage. The Bauschinger effect of steel is negligible in the case of RC sections undergoing non-reversed cyclic loading, but becomes significant for reversed cyclic loading that is extended into large inelastic deformation. Besides section analyses, a two-dimensional nonlinear finite element procedure is also developed for better understanding of the behaviour of RC beams under monotonic and non-reversed cyclic loading. In particular, the local bond-slip effect is modelled by linear displacement contact elements. The numerical predictions are validated by experimental results. With the proper choice of bond parameters, results show that the procedure is capable of modelling the for

A vast development in the construction industries indicate the highly demand for the use of concrete. This also effect the depletion problem of natural coarse aggregate such as granite, crushed rock , and stone from the quarries. Thus, as an alternative to replace the natural coarse aggregate, synthetic coarse aggregate is produced to overcome the problem. This research involves the investigation of the flexural behavior of reinforced lightweight concrete beam made from synthetic lightweight coarse aggregate (SYLCAG). The SYLCAG is used to replace partially function of natural coarse aggregate. A reinforced concrete beam was tested in the flexural beam test using the four-point loads test. The compressive strength and the flexural behavior of the lightweight beam were two important parameters examined during the beam tests. The paper compares flexural performance of the lightweight beam and the normal beam in the term of failure modes, load deflection response, and ultimate load with those of the theoretical analysis. The theoretical results for ultimate load and deflection was predicted using equation provided by the ACI 318-05 building code and EC2. From the result, it shows that the SYLCAG concrete has slightly lower compressive strength and lower density than the normal concrete. The strength of SYLCAG concrete that was developed was about 93% from strength of control concrete. However the ultimate load of SYCLAG beam was 116% of the ultimate load of control beam. SYLCAG beam also has achieved 98% deflection of control beam and 79% deflection of the theoretical value. It can be conclude that the SYLCAG beam exhibit similar flexural behavior as that of normal concrete.

The use of stay-in-place (SIP) formwork has become an increasingly popular tool for concrete

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structures, providing advantages in construction scheduling and labour reduction. Stay-in-place formwork made of strong materials such as fibre reinforced polymer (FRP) and steel have proven to supplement and even replace reinforcement in concrete elements. The use of polyvinyl chloride (PVC) SIP formwork has also been explored. Current research suggests that PVC provides an enhancement to reinforced concrete strength and ductility.

Flexural behaviour is one of the element in determine whether the materials involve in the case study can be used as part of the structure. This study reported on the flexural behaviour of reinforced concrete beams construct from synthetic lightweight coarse aggregate (SYLCAG) produced from offshore sand which is used as alternative to replace normal weight aggregate where they are over exploited nowadays. The development of this study were experimentally to determine the capabilities of the offshore sand as synthetic lightweight coarse aggregate (SYLCAG) used in structural reinforced concrete. Compressive strength test were carried out to determine the strength of concrete using SYLCAG. Flexural strength test were carried out with increasing load using four point load test method until the designed reinforced beam fails. The load applied and deflection were recorded in timely manner. Experimental ultimate load capacity and deflection were then compared with the theoretical calculations which calculated from Eurocode 2 for the ultimate load capacity and ACI code or the deflection. The cracks occurred are visualised to determine the mode of failures. This study find that concrete made of SYLCAG has low strength. Other than that, for the four point test, SYLCAG reinforced concrete beam has shown lower load capacity can be taken before the beam fail as about 50% of the normal concrete design of the same strength. At early stage, SYLCAG concrete show positive failure mode and as the load apply increased, it tend to have failure mode in shear.

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