Effect of Steel Area Reduction on Flexural Behaviour of Spalled Reinforced Concrete Beams

REINFORCED CONCRETE DESIGN 3E

This dissertation, "Nonlinear Analysis of Reinforced Concrete Beams and Columns with Special Reference to Full-Range and Cyclic" by Zhishen, Bai, I., was completed at The University of Hong Kong (Pokfulam, Hong Kong) and is being studied pursuant to the Creative Commons Attribution 3.0 Hong Kong Licence. The content of this page has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and the reading of the dissertation. All rights not granted by the above licence 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 Zhishen for the degree of Doctor of Philosophy at The University of Hong Kong in December 2005. In this thesis, the nonlinear behaviour of reinforced concrete (RC) beams and column made of normal- and high-strength concrete under both monotonic and cyclic loading is studied. The full-range moment-curvature relationships are obtained on a numerical method that considers the cyclic response of constitutive materials. A two-dimensional nonlinear finite-element procedure is also developed for the analysis of RC beams under monotonic and reversed cyclic loading. For RC beam sections, it is found that the full-range flexural behaviour is basically dependent on the tension to steel reinforcement. The full-range moment-curvature curves under monotonic loading have long yielding plateaus while those for reversed sections have sharp peaks. The full-range moment-curvature curves under monotonic loading in sagging and hogging are parallel while those for reversed sections have sharp peaks. The full-range moment-curvature curves under monotonic loading in sagging and hogging are parallel while those for reversed sections have sharp peaks.

Reversal Cyclic loading generally causes overall residual tensile strains in RC sections, and especially significant for the beam sections. The variation of neutral axis depth during monotonic and cyclic loading shows different trends for different beam 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. 

Flexural Behaviour of Reinforced Concrete Slab with Opening

The Flexural Behaviour of Precast Reinforced Concrete Beam for IBS Connection

Conclusa

Flexural Behaviour of Reinforced Concrete Members at Transient high Temperatures

An Experimental Investigation Into the Effects of Shear and Tension on the Flexural Behaviour of Reinforced Concrete Beams

Nonlinear Analysis of Reinforced Concrete Beams and Columns with Special Reference to Full-Range and Cyclic

FLEXURAL BEHAVIOUR OF FIBRE REINFORCED POLYMER STRENGTHENED REINFORCED CONCRETE BEAMS AT ELEVATED TEMPERATURES.

Guide for the Design and Construction of Reinforced Concrete Beams with FRP Bars

Flexural Behaviour of Continuously Supported FRP Reinforced Concrete Beams

The Flexural Behaviour of Lightly Reinforced Concrete Member

Fatigue Flexural Behaviour of Reinforced Concrete Beams with Non-prestressed and Prestressed Basalt Fiber Reinforced Polymer Bars

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, but 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 BFRP bars in reinforced concrete members 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 present an experimental study on 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 behavior of similar machined basalt rebars tested under fatigue loading in air. Sixteen beams with dimensions of (2400x300x150mm) and S600 FRP rebars were tested. The parameters that varied were the level of prestress of the bars (3%, 20% and 40% of their static tension capacity) and the fatigue load range. 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 prestress 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 bars, there is no benefit in fatigue performance above 20% and 13% of the ultimate capacity of the beams at a level which 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 three data for the beam tests fall onto a single curve at load levels where the remaining prestress did not close cracks no longer closed the crack at the minimum load.

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Axial-Flexural Behaviour of Reinforced Concrete Masonry Columns Confined by FRP Jackets

Flexural Behaviour of Reinforced Concrete Flat Slabs Supported on Non-rectangular Column Grid

Flexural Behaviour of Concrete Beams Reinforced with FRP C-bar Reinforcing Rod

Flexural Behaviour of Reinforced Concrete Beams at Working Loads

Flexural Behaviour of Reinforced Concrete with Rectangular Hollow Section

Flexural Behaviour of Reinforced Concrete Slabs with Ferrocement Cover

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 from synthetic lightweight coarse aggregate (SYLCAG) produced from offcuts sand which is used as alternative to replace normal weight aggregate where they are over exploited nowadays. The development of this study was experimentally to determine the capabilities of the offcuts 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 for 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 load 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.

Flexural Behaviour of Continuous Reinforced Concrete Beams in Relation to Ultimate Capacity

A Study of the Bond and Flexural Behaviour of Reinforced Concrete Elements Strengthened with Near Surface Mounted (NSM) FRP Reinforcement

Nonlinear Flexural Behaviour of Reinforced Concrete Beams and Slabs [microform]

Flexural Behaviour of Corroded Reinforced Concrete Beams

Flexural Behaviour of Reinforced Synthetic Lightweight Coarse Aggregate (SYLCAG) Concrete

The moments at gauged sections were evaluated by means of a digital computer program. Strains measured on the surface of the concrete and the tensile reinforcement were related to parameters determined from compressive tests on concrete cylinders. The resistance moment, force and other quantities appertaining to the section were calculated for all states of loading over the entire range of behaviour up to collapse. Unlike methods utilising moment-curvature relationships subsidiary tests to determine these characteristics were not required. The data used were obtained from tests on control samples of reinforcement and concrete. A least squares curve fitting routine was used to produce a second order best fit strain profile for the strains measured across a given section. The second order profile being preferred to the more usual straight line assumption as it enabled the position of the neutral axis to be related to both the flexural and compressive strains measured on the section. A mathematical model for the concrete was set up in the computer based on the data from the control tests on the concrete cylinders. This model and the strain profile were then combined on the basis of the extreme fibre strain and the depth of the neutral axis to calculate the moment of resistance, force and curvature for the section. The value of the strain on the tensile reinforcement was compared with the strain in the concrete at that level to enable the moment of resistance in tension to be calculated and compared with the moment of resistance in compression. Tests were carried out on a series of simply supported beams to prove the approach. For the beams tested the proportion of mild steel tensile reinforcement varied from 0.4% to 5.0% of the cross-sectional area.

Study of the Flexural Behaviour of Concrete Beams Reinforced with Steel Plates

Tailor Made Concrete Structures

Fatigue Flexural Behaviour of Corroded Reinforced Concrete Beams Repaired with CFRP Sheets

An Experimental Investigation Into the Effects of Shear and Tension on the Flexural Behaviour of Reinforced Concrete Beams

Flexural Behaviour of Fibre Reinforced Concrete Beams Containing Polyethylene Terephthalate (PET) Wastes

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 behaviour of reinforced lightweight concrete beam made from synthetic lightweight coarse aggregate (SYLCAG). The SYLCAG is used to replace partially 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 responses, 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 92% from strength of control concrete. However the ultimate load of SYLCAG 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.

Tests to Determine the Flexural Behaviour of Reinforced Concrete Blockwork

The Flexural Behaviour of Redundant Reinforced Concrete Frames

The Performance of Concrete Using Synthetic Lightweight Coarse Aggregate (SYLCAG) on Flexural Behavior

Flexural Behaviour of Corroded Reinforced Concrete Beams

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. The experimental results for FRP confined concrete masonry columns 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 complex 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 results. 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.

Flexural Behaviour of Reinforced Concrete Beams with Opening