Faculty of Engineering

CREEP AND SHRINKAGE DEFORMATION OF FRP SHEET STRENGTHENED REINFORCED CONCRETE BEAM

Khairul Anwar Bin Zukiflee

Bachelor of Engineering with Honours

(Civil Engineering)

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UNIVERSITI MALAYSIA SARAWAK

BORANG PENGESAHAN STATUS TESIS *

JUDUL: CREEP AND SHRINKAGE DEFORMATION OF FRP SHEET STRENGTHENED REINFORCED CONCRETE BEAM

SESI PENGAJIAN: 2009 / 2010

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ABSTRACT

Innovation in enhancing the performance of concrete structure members had been introduced using externally bonded fiber reinforced polymer sheet. This technique has been reported effective in enhancing the strength of bridge structure and beam. The fiber reinforced polymer (FRP) strip is attached to the beam with an adhesive. The purpose of this research was to investigate the flexural behavior and long-term performance in terms of deflection taking on the effect of creep and shrinkage effect for reinforced concrete beam strengthened with fiber reinforced polymer sheet. The behavior of the beams was studied through their load-deflection characteristic and time-deflection characteristics. In addition, the tension stiffening model was introduced to determine the accurate stiffness of the cracked section. In theoretical study, a comprehensive analytical method is proposed to calculate the short term and long term deflection of both normal RC beam and RC beam strengthened with FRP sheet. The theoretical prediction is compared it with experimental results. In the experimental study, three normal RC beam will act as a control beams (reinforced concrete beam without FRP sheet attached) where one RC beam is tested for the short term flexural behavior under sustained load and another two is tested for the long term behavior under uniformly distributed load. The results indicated that the strengthened beam performed better than the control beams and analytical method used give an approximate result to the experimental analysis.

ABSTRAK

Teknik menggunakan lekatan kepingan fiber tetulang polimer (FTP) telah diperkenalkan untuk meningkatkan keupayaan anggota struktur konkrit. Teknik ini telah dibuktikan efektif dalam meningkatkan kekuatan bagi struktur jambatan dan alang. FTP dilekatkan ke permukaan struktur konkrit menggunakan satu gam khas. Tujuan pengajian ini adalah menyelidik sifat dan prestasi alang konkrit bertetulang yang diperkuatkan dengan kepingan FTP dalam tempoh singkat dan lama dengan mengambil kira kesan rayapan dan pengecutan konkrit. Prestasi struktur konkrit dikaji melalui ciri-ciri lengkungan beban-lenturan dan masa-lenturan. Sejajar dengan itu, satu model tegang ketegaran diperkenalkan bagi mendapatkan ketegaran bahagian yang retak dengan lebih tepat. Untuk kajian melalui teori, satu analitikal prosedur dicadangkan bagi menghitung lenturan dua jenis alang (normal konkrit bertetulang dan konkrit bertetulang yang diperkuatkan dengan kepingan FTP) untuk jenis kajian yang bergantung dengan masa atau lenturan serta-merta dan membandingkan keputusan teori dengan keputusan daripada eksperimen. Untuk kajian melalui eksperimen, tiga jenis alang yang bertindak sebagai alang kawalan (alang tanpa lekatan kepingan FTP) dimana, satu daripadanya diuji dalam tempoh masa segera dibawah beban khidmat dan dua alang yang lain akan di uji di bawah beban seragam dalam tempoh masa yang panjang. Keputusan kajian menunjukkan alang yang diperkuatkan, lebih baik daripada konkrit bertetulang normal dan kaedah analitikal yang digunakan member keputusan yang menghampiri nilai analisis daripada eksperimen.

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