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JUDUL : LOAD CARRYING CAPACITY OF DRY FLOOR PANEL SYSTEM

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LOAD CARRYING CAPACITY OF DRY FLOOR PANEL SYSTEM

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A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Engineering (Civil-Structure)

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November 2006

“I declare that this project report entitled “LOAD CARRYING CAPACITY OF DRY FLOOR PANEL SYSTEM” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.”

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ABSTRACT

This paper describes the application of finite element modelling to study structural performances of a dry floor system, consisting of plywood attached to top layer of profiled steel sheet by self-drilling, self-tapping screws connector. Parametric study was carried out by using various profiled steel sheet thickness, plywood thickness and different geometry of profiled steel sheet. The preliminary FE model was validated using experimental study. Parametric studies showed 96.72% increased in flexural stiffness when the thickness of profiled steel sheet was changed from 0.8mm to 1.8mm. The increment of plywood thickness from 9.5mm to 25mm has increased flexural stiffness of the slab up to 23.00% in a quadratic form. Different geometry of profiled steel sheet affects the load carrying capacity of the proposed dry floor panel where SDP gives 1.42 to 1.49 higher in flexural stiffness per 1 unit area of steel compared with PEVA. This means SDP profile will give more economical design compared with PEVA profile. A theoretical formula was proposed to predict the flexural strength of the slab. Moment capacity predicted from FE analysis performed 1.06 safety factor over theoretical formula and 1.40 over experimental results. FE analysis had indicated high degree of accuracy and revealed that the prediction moment capacity using FE analysis and theoretical formula are conservative and safe for design purpose. It can be concluded that the proposed dry floor panel has a great potential to be exploited as alternative flooring system.

Keywords: Profiled steel sheet; dry flooring system; composite panel

ABSTRAK

Kertas kerja ini membincangkan penggunaan kaedah permodelan unsur terhingga untuk mengkaji kelakuan struktur sistem lantai kering. Cadangan sistem lantai kering ini terdiri daripada papan lapis disambungkan ke atas plat keluli berprofil secara mekanikal mudah dengan menggunakan skru. Kajian parameter melingkungi kesan ketebalan plat keluli berprofil, kesan ketebalan papan lapis and kesan bentuk geometri yang berbeza ke atas keupayaan galas beban sistem lantai kering. Analisis permodelan pertama diselaraskan dengan keputusan eksperimen. Daripada kajian parameter dengan analisis unsur terhingga, kesan ketebalan plat keluli berprofil menunjukkan pertambahan sebanyak 96.72% dari segi kekuatan lenturan apabila tebal plat keluli berprofil bertukar dari 0.8mm ke 1.8mm. Manakala kesan ketebalan papan lapis hanya menunjukkan pertambahan sebanyak 23% apabila tebal papan lapis bertukar dari 9.5mm ke 25mm. Profil SDP lebih kuat sebanyak factor 1.42 ke 1.49 berbanding profil PEVA dari segi kekuatan lenturan per unit keluasan profil . Ini menunjukkan geometri SDP menonjolkan rekabentuk yang lebih ekonomi. Keupayaan moment kapasiti yang berdasarkan analisis unsur terhingga mensyorkan faktor 1.06 berbanding dengan keupayaan moment kapasiti yang dikira melalui penggunaan formula teori bahan elastik; dan faktor sebanyak 1.40 berbanding dengan keupayaan moment kapasiti yang dikira berdasarkan keputusan eksperimen. Analisis penggunaan unsur terhingga menunjukkan nilai ketetapan yang tinggi. Secara bandingan dengan keputusan eksperimen, anggaran moment kapasiti menggunakan kaedah unsur terhingga dan formula teori bahan adalah selamat digunakan dalam proses rekabentuk. Sebagai kesimpulan, cadangan sistem papak kering mempunyai potensi yang tinggi diesploitasikan sebagai alternatif sistem lantai konvensional sekarang.

Kata Kunci: Plat keluli berprofil; lantai kering; komposit

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