

OUTRIGGER SYSTEM FOR INTERCONNECTING
THREE DIMENSIONAL MULTI-STORIES BUILDINGS

LEE TECK SHIN

UNIVERSITI TEKNOLOGI MALAYSIA

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ABSTRACT

In tall buildings design, lateral loads induced by wind or earthquake forces are often resisted by an outrigger system. This system is often chosen as its function by tying the structural components together to provide sufficient lateral stiffness to the structure and control the excessive drift due to the lateral load. This thesis is to analyze the behavior of two 30 stories residential buildings that interconnected by a link bridge which acted as an exterior outrigger system at different heights and also the outrigger system location optimization. A total of five models with different configuration of exterior outrigger system which interconnecting the two multi-stories buildings had been analyzed by using ETABS software program. There is one model with no outrigger system is applied, three models with outrigger system interconnected at different height locations which are level 10, level 20 and level 30 of the buildings respectively, and last model with outrigger system is applied at three levels which are level 10, 20 and 30. The modeling process was carried out in such a way that the behavior and performance of the structure was within the limitations suggested by BSI (2001) CP 3: Chapter V-2: 1972. From the results, the percentage of reduction in lateral displacement is directly proportional to the number of level of outrigger system applied to the multi-stories buildings. By comparison, it is structurally efficient to locate an exterior outrigger system at the top of a building. Study has shown that it is indeed helpful in reducing the lateral displacement of building structure by applying the outrigger system as an exterior structural system for interconnecting between the multi-stories buildings.

ABSTRAK

Dalam sebuah reka bentuk bangunan tinggi, beban sisi yang disebabkan oleh angin atau daya gempa sering ditentang menggunakan sistem katir. Sistem ini sering digunakan kerana fungsinya yang boleh mengikat komponen struktur untuk menyediakan ketegangan yang mencukupi bagi struktur dan seterusnya mengawal pergerakan yang melampau yang disebabkan oleh beban sisi. Kertas kerja ini adalah untuk mengkaji tingkah laku dua bangunan kediaman 30 tingkat yang dihubungkan oleh sebuah jambatan. Jambatan ini berfungsi sebagai sistem katir luaran pada ketinggian yang berbeza dan perbezaan pengoptimuman lokasi sistem katir. Lima model yang berlainan konfigurasi pada sistem katir luaran telah dianalisis menggunakan perisian ETABS. Satu model dianalisis tanpa menggunakan sistem katir luaran, tiga model dengan sistem katir luaran pada ketinggian yang berbeza iaitu pada aras 10, 20 dan aras 30, dan model terakhir mempunyai sistem katir luaran pada tiga aras iaitu aras 10, 20 dan aras 30. Kelakuan dan prestasi model bangunan yang dikaji adalah seperti yang dicadangkan oleh BSI (2001) CP 3: Chapter V-2: 1972. Keputusan menunjukkan model bangunan dengan sistem katir pada aras 10, 20 dan aras 30 masing-masing dapat mengurangkan anjakan sisi sebanyak 15.32%, 26.04% dan 29.76%. Daripada keputusan yang diperolehi, peratusan pengurangan pada anjakan sisi bangunan adalah berkadar terus dengan nombor aras di mana letaknya sistem katir luaran pada bangunan. Melalui perbandingan, ianya efisien untuk meletakkan sistem katir luaran pada bahagian atas bangunan. Menurut kajian, sistem katir luaran terbukti dapat membantu dalam mengurangkan anjakan sisi pada struktur bangunan apabila ianya berfungsi sebagai sistem struktur luaran yang menghubungkan dua bangunan.