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Title : SEISMIC PERFORMANCE BETWEEN UNREPAIRED AND REPAIRED OF TUNNEL FORM BUILDING UNDER LATERAL CYCLIC LOADING

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A total numbers three units of one-third scale 3-storey tunnel form building (TFB) were designed using BS8110, constructed, tested under in-plane and out-of-plane lateral cyclic loading in the heavy structural laboratory. Two numbers of single units TFB were repaired using steel angle, steel plate and CFRP fabric and retested under in-plane and out-of-plane lateral cyclic loading. Another double unit TFB also repaired using additional shear wall, steel angle and CFRP fabric and retested under in-plane lateral cyclic loading only. The visual observation of damages, lateral strength capacity, stiffness, ductility and equivalent viscous damping were determined for all the unrepaired and repaired specimens. Based on the experimental results, the repaired of single unit TFB using steel angle, steel plate and CFRP fabric has higher value of lateral strength capacity, ductility and equivalent viscous damping than unrepaired single unit TFB. Likewise, the repaired double unit TFB using additional shear wall, steel angle and CFRP fabric also has higher value of lateral strength capacity, stiffness, ductility and equivalent viscous damping than unrepaired double unit. It was found that the repaired double unit TFB is the best method of repair and retrofit technique for this research work. It is important to validate the experimental hysteresis loops with model hysteresis loops using the HSTERES program before using this model hysteresis in modeling the TFB using the RUAUMOKO 2D program. Wayne Stewart Rule Model with hysteresis rule number 54 was chosen to validate with experimental results and all the performance parameters were less than 5%. Therefore, this model can be used to determine the dynamic behavior and analysis using Ruaumoko 2D under ten different earthquake excitations inclusive in Malaysia and around the world. From nonlinear time history analysis, it was discovered that double unit TFB can survive under minor to moderate earthquake events which is less than 5 Scale Richter. Further analysis on seismic assessment of repaired double unit TFB was conducting using fragility curve because this is the best method should be adopted to the construction industries if severe damage occurred to the TFB buildings after earthquake. From the analysis of fragility curve, it was noticed that the repaired double unit TFB survive under six local earthquakes in Malaysia, DBE (Type 1 and Type 2) and MCE (Type 1).