Paunumart Yotarmart 2010: Effect of Large Opening on Behavior of Reinforced Concrete Beam by Nonlinear Finite Element Analysis. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Assistant Professor Kitjapat Phuvoravan, Ph.D. 216 pages.

This paper presents nonlinear analytical study on the flexural behavior of reinforced concrete (RC) beam with large opening by finite element analysis . The RC beam was modeled by three dimensional solid elements and truss elements with nonlinear material property. Different sizes of large opening were considered before analysis process, since the complex behavior of flexural failure takes place around the large opening. In the consideration of failure, representation of plastic hinge formation and appropriate modeling technique must be employed.

The analysis results show that the opening size has a significant effect on the load-deflection behavior and ultimate load capacity. The ultimate load capacity decreases by 44.89 % when the opening length is 120 cm. (form 300 cm. total beam length), and it decreases by 38.14 % when the opening depth increases to 65 percent of the total beam depth. In addition, The results from the 3-D analytical model show that the opening size and its location has a significant effect on the load-deflection behavior and ultimate load capacity. When the slenderness ratio of opening is not more than 22 ($Kl/r < 22$) and the depth of opening is not more than 40% of the depth beam the ultimate load capacity decreases by 5%.

Furthermore, one dimensional beam model with rigid links was also developed to propose simplified altermative modeling technique of RC beam with large opening. When comparing the ultimate load capacity between 3D analysis model and 1D analysis model, the maximum difference is apporximatly 20%. Thus, it can be concluded that 1D analysis model can only be used to roughly approximate the capacity and the behaviour of RC beam with large opening.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature