Title:
Behavior of RC shear walls with composite boundary elements

Abstract:
Probably, the wall is historically one of the oldest structural elements utilized by human. Nowadays, the utilization of shear walls has been increasingly developed and completed as an efficient and optimal method for bearing the lateral loads. This thesis is a research which studies the impact of applying the steel profile in this section on the ultimate bearing capacity and formability of reinforced concrete shear wall considering the responses such as the load-displacement diagram through the nonlinear 3D finite element model with focus on the role of boundary elements. This research uses the nonlinear finite element analysis of reinforced concrete and damage plasticity behavioural model for modelling the behaviour of concrete. For more consistency with the physical reality of issue, an experimental model, which has all specifications of a wall with boundary element, is initially selected and the finite element models are built based on this model (as a base model) by investigating most of the tests performed on the concrete shear walls. In the next step, the correlation and consistency of experimental results and numerical modelling is studied and verified by finite element software and it is found that the finite element numerical modelling can be the appropriate prediction of wall behaviour with high precision. Finally, the set of shear wall with composite boundary element (the reinforced concrete shear wall in which the boundary element is composed of composite column) is modelled in software after verification of base model, and then the effect of increased confinement of boundary element (the use of steel profile in boundary element increases the confinement) on the behaviour and capacity of shear wall is studied and compared with base model by changing the parameters affecting the behaviour of boundary element and maintaining other geometrical dimensions and parameters of shear wall. The obtained results of analysing the numerical models indicate that the use of steel profile in boundary element cannot have a considerable impact on the ultimate bearing capacity of wall (the response of finite element analysis indicate a reduction of capacity by about 4%) and it also has no significant impact on the formability of short concrete shear wall under the lateral load, but it affects the cracking model of wall, or in other words, the prevention of expanded cracks particularly the main diagonal cracks of shear wall girder web.

Keywords:
Concrete shear wall, composite shear wall, boundary element, composite column, finite element analysis, damage plasticity model, ABAQUS