**AN EXPERIMENTAL STUDY TO DETERMINE THE EFFECT OF LAP SPLICE LOCATION IN COLUMNS ON THE BEHAVIOUR OF RC FRAME TYPE SYSTEMS**

**SUMMARY**

The aim of the structural engineering is to design structures under loads of self weight, live loads, earthquake and so on in the most economic way and with sufficient strength taking advantage of the phsyical properties of the materials which constitute the elements of structure. Thanks to the last technological developments new numerical solution methods unveiled that some structural concerns like the effects of the earthquakes on the structures that were hard to solve before comes with more exact results. As a result of these recent developments the effect of various structural parameters on seismic performance of structures got involved in considerable research subjects. Within the scope of this thesis the subject lacking in literature “the effects of the location of lap splices in reinforced concrete columns on the performormance of reinforced concrete structures” was investigated on a full scale reinforced concrete frame which one of the column lap splices locate at the bottom of the column and the other at the middle 1/3 part of the column was investigated experimentally and was supported with numerical models using two structural analysis softwares used in academic area which called DC2B and VecTor5. The thesis consists of four major parts. In the first part of this thesis brief information about the splices of reinforcement in reinforced structures was given then summary about the literature review takes place. The last subtitle of the first part is about the explanation of the parts of this thesis. The second part includes experimental works done so that general geometric and reinforcement details of the elements of the specimen was introduced. The manufacture stages of the specimen, material tests including 28 days strength of cubic concrete samples took while concrete casting and tensile tests of longitidunal and transverse reinforcement samples and core concrete samples that were taken after the experiment, the measurement devices and the results derived from the experiment data comes afterwards. In the third part of this thesis the numerical works carried out were explained. The subjects of softwares information, sectional analysis results according to idealized material properties done with XTRACT software, software analysis results, modelling techniques are the scope of this part. In the last part of the thesis results were summarized. xxiv In the experimental researchs done before all specimens tested were cantilever columns or beams that behaves with single curvature under lateral loads. The most important difference of this thesis is the specimen used for experiment is fully scaled frame that the columns of such frames behaves with double curvature (occuring of contraflexure point near the middle point of column) so that the performance of lap splices at the each location can be inspected. The common results derived from the researchs done before are the bottom sections for each type column that has lap splices at bottom part and out of bottom part behaves similar however the curvatures at the sections just above the bottom sections differs significantly which means the plastic hinge length constrained in the columns that have lap splices at the bottom part. Also the columns with lap splices at the bottom parts have greater flexural rigidity than their counterparts. The parameters like the thickness of the cover concrete, lap splice length,the moment gradient along the lap splice length are also important variables for the performance of lap splices. The lateral displacement – load graph have been introduced and the displacement ductility calculated according to the backbone curve of the hysterisis because of the different forces measured for pushing and pulling direction as a result of experiment setup. With the help of the straingauges located at different sections of the columns bending moment values and curvatures have been calculated and lateral diplacement – curvatures and curvatures – bending moment graphics have been introduced. The methodology used for calculation of bending moments and curvatures are the subject of the third part of this thesis. To validate the methodology used for calculation of bending moments from strain gauge data the the sum of the base shear forces calculated from the bending moments at the sections located at the bottom and top parts of the columns were compared with the loads that got from the experimental work. The software that is capable of processing lineer and nonlineer analysis of 2D frames that can be contains of different types of elements was introduced. The Mander concrete model that can consider transverse reinforcement effects and idealized bilinear reinforcement models according to the material tests were given as input data to XTRACT sectional analysis program and curvature - bending moment relationship derived. According the curvature – bending moment relationship derived from XTRACT static pushover analysis done with DC2B and the results introduced compareble with the lateral displacement – force result derived from experiment introduced. A nonlinear sectional analysis program for two dimensional frame-related structures consisting of beams, columns and shear walls, subjected to temperature, static including monotonic, cyclic and reversed-cyclic loads and dynamic loading conditions namely VecTor5 is used to perform static pushover and reversed-cyclic analysis of the test specimen. The concrete model used for static pushover analysis is combination of the Popovics and modified Kent-Park concrete models that compression base curve is firmer and post peak behaviour model chosen as later and the reinforcement material model is the same as DC2B. For performing reversed-cyclic analysis the model used for concrete is modifed Palermo model and for reinforcement material models the Seckin model used that can consider Bauschinger effect due to the load reversals. xxv As a result the flexural rigidity of the section of the column that has lap splice at the bottom part was greater than its counterpart. The curvatures at the bottom sections of the both columns with lap splice at the bottom and at the middle part was the same however there were significant differences at the sections just above these bottom sections.