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Beam and Column Joint Exterior Behavior

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ABSTRACT

But recently due to use of high grade of concrete and better quality control in the RCC structures, confinements in the joints as per the new provision of codes leading us to the problem of the congestion. It has been observed at many construction sites that this congestion leads to poor workmanship at the joints, which actually making the joint more vulnerable than previous. Researcher has been working on this area to counter act by Increasing the size of the joints, Using the steel fiber in the joints, Using GRFP to wrap the joints, Prestressing the beam including the joint, Using of the crossed rebar at the joint cores. Due to prestressing of joint through the beam has not been so effective and economical, the present paper come up with the direct way of prestressing the joints. This paper tries to combine the benefits of the crossed rebar and prestressing in the joints together.

***Keyword**: beam, column, joints*

INTRODUCTION

Past is witness to many devastation and destruction of structure due to joint failures due to earthquakes. Beam-column joint has not been area of research for many decades because scientist believes that beam column joint behave as rigid joint with no deformation contributed by it. Beam-column joint has no problem in itself until the dead and live loads are concern. As soon as lateral loads, i.e. seismic force, comes into picture it will become a critical problem. This problem has not been solved completely till date. It can be seen how the time has evolved to witness the development in the understanding of the beam-column joint core behaviour, specially related to shear force and shear deformation. Still we have translucent vision about this area. In the following discussion an endeavour is just tried to remove the dust from this area so as to make it as clear as pure water. As we know that, practically we can't construct the structure earthquake-proof, so there must be way out to earthquake problem. And we are fortunate enough that the solution come in only one term and that is ductility. Make the structure enough ductile and forget about the force which is going to come on it. So in short the solution to the problem of earthquake is ductility. So whatever going to come in the way of ductility and your structure you have to kill that, simple enough to understand? So in this process of removing our enemy through the research of 70 years in the seismic design, only beam-column joint shear failure is left behind. Before getting into the objective and scope of the project work on the beam-column joints an introduction is presented in the following sections.

What is beam to column joint?
The portion of the column where beam is use to join it is called beam-column joint. Beamcolumn joints are classified into three types based on the number of beams ending into the column

i) Interior Beam-Column joints
ii) Exterior Beam-Column joints
iii) Corner Beam-Column joints

LITERATURE REVIEW

Bakir and Boduroglu (2002) proposed a model for the prediction of the shear strength of the beam-column joints. The paper considers the three new parameters for the first time to predict the shear strength of the joint. These parameters are beam longitudinal reinforcement ratio, beam-column joint aspect ratio and the influence of stirrups ratio. It concluded that beam longitudinal reinforcement ratio has positive effect on the joint shear strength. Because the influence of beam longitudinal reinforcement ratio is taken into account, the proposed equation predicts that the joint shear strength is proportional to (hb/hc)0.61.The paper also concluded that the column axial load has no effect on the shear strength but the high column axial load and high column longitudinal reinforcement is required to prevent the column failure. Park and Mosalman (2009) given a shear strength model of the exterior beam-column joints without shear reinforcement, which can be useful in required confinement reinforcement to prevent the shear damage.

Muhsen and Umemura (2011) proposed a model to estimate the strength of the interior beam-column joint with consideration of the confinement reinforcement and axial force. The proposed model is similar to the current ACI and AJI codes with little modification in the effective area of the joint panel and considering the confinement due to axial force in the column and confinement reinforcement in the joint core. None of the codes has considered the confinement effect in the estimation of the shear strength of the beam-column joint. Pimanmasa and Chaimahawanb (2010) present paper to prevent the beam-column joints by enlarging the joint area. The paper concluded that the joint enlargement as shown in the Fig: 2.2.1 is a very effective method to reduce the shear stress transmission in the joint panel and hence effective in preventing the damage. There has been also change in the failure mode with the relocation of the plastic hinge from the face of the beam to the face of the enlarge section. The model is well explain with the strut and tie model.

Conclusion -The objective of the present study was defined as. In order to achieve first objective a family of multi-storeyed plane frame with varying building-height, storey-height, base-width, number of bays, column and beam dimensions and grade of concrete were selected. The selected building models were analysed and design according to IS 456:2000 using commercial software STAAD.Pro. Results were analysed to find out the effect of all the above parameters on the shear force demand of critical beam-to-column joints. Also an effort has been made to detect the location of the critical joint in the multi-storeyed framed building.

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