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Study The Behavior Of Beam-Column Joint And Enhancement Of Efficiency

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Abstract : Beam column joint is an important component of a reinforced concrete moment resisting frame and should be designed and detailed properly, especially when the frame is subjected to earthquake loading. Failure of beam column joints during earthquake is governed by bond and shear failure mechanism which are brittle in nature. Therefore, a current international code gives high importance to provide adequate anchorage to longitudinal bars and confinement of core concrete in resisting shear. Modern codes provide for reduction of seismic forces through provision of special ductility requirements. Details for achieving ductility in reinforced concrete structures are given in IS 13920.

Beam column joints are generally classified with respect to geometrical configuration and identified as interior, exterior and corner joints. In order to study the behavior of beam-column joint, the specimens were prepared in a T shaped beam. The dimensions of beam were set as per IS specifications. The length of beam is 50 cm including thickness of column. The length of column is 50 cm. The height and width of T beam is kept 10 cm each. The following figures illustrate the dimensions of T beam

Key words : column, joint, beam, reinforced, sheer, etc.

Introduction : Beam column joints in a reinforced concrete moment resisting frame are crucial zones for transfer of loads effectively between the connecting elements (i.e. beams and columns) in the structure. In normal design practice for gravity loads, the design check for joints is not critical and hence not warranted. But, the failure of reinforced concrete frames during many earthquakes has demonstrated heavy distress due to shear in the joints that culminated in the collapse of the structure. Detailed stu

dies of joints for buildings in seismic regions have been undertaken only in the past three to four decades. It is worth mentioning that the relevant research outcomes on beam column joints from different countries have led to conflicts in certain aspects of design.

Procedure

The different specimens were prepared by changing the grade (mix) of concrete at beam-column joint. These different specimens were

Table 1:-showing details of specimens

S.NO	SAMPLE	DETAILS OF SAMPLE
1	SAMPLE 1	M15 USED UNIFORMLY
2	SAMPLE 2	M15 AND M25@L/3 IN THE DIRECTION OF BEAM
3	SAMPLE 3	M15 AND M20@JOINT
4	SAMPLE 4	M15 AND M25@JOINT
5	SAMPLE 5	M15 AND M20@L/3 IN THE DIRECTION OF BEAM

tested after 7 days and 28 days. Each specimen is provided with 4 nuts and bolts for the purpose of fixity. A suitable arrangement is made at the time of testing for achieving the fixity condition as illustrated.

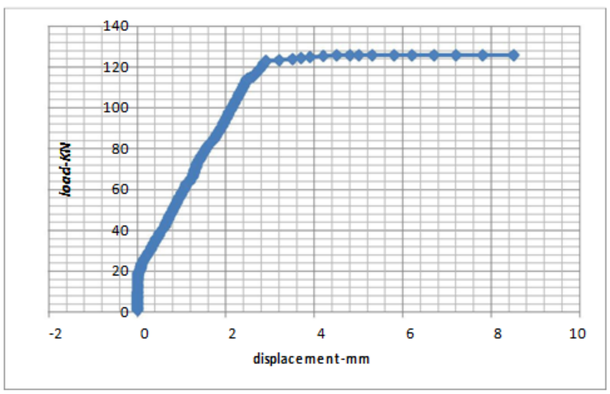
Different grades of concrete were used at the joint like M25, M20, M15 etc. The testing of specimens after 7 days and 28 days were conducted on UTM.

The following are the details of tests carried on specimens:

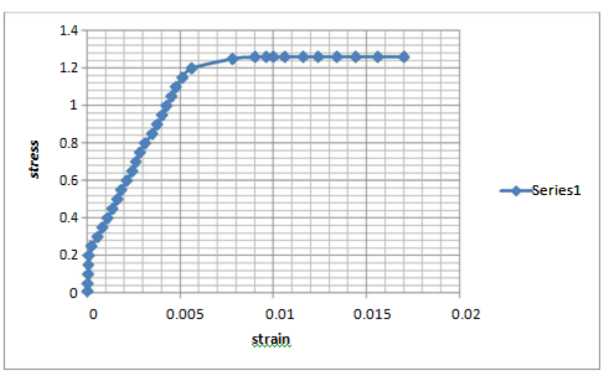
After 7 days and 28 days testing on UTM , the results of each test are summarized below:

1) Sample 1

M15 grade used uniformly throughout the beam with no variation of concrete grade at joint. The specimen was tested after 7 days and 28 days using UTM with suitable arrangement for fixity. The load-displacement and stress-strain curves for the sample 1 are given below:

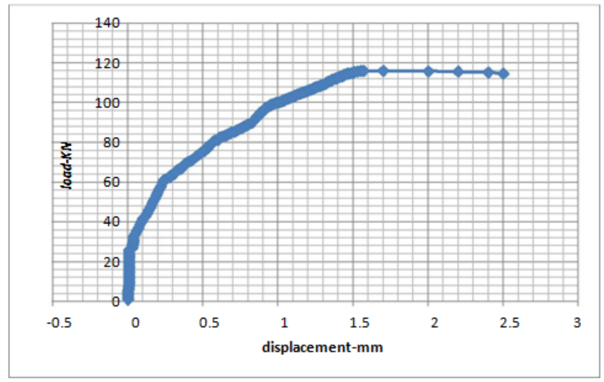


Load-displacement curve (sample 1)

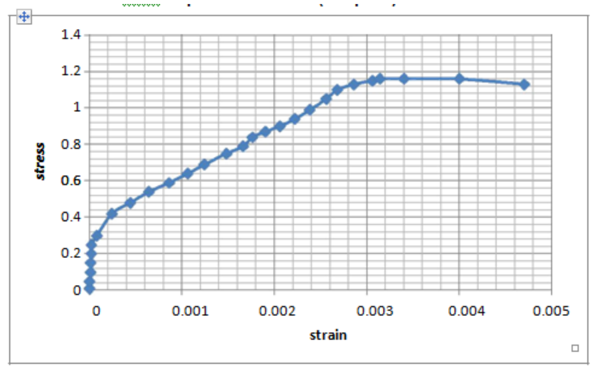


Stress-strain curve (sample 1)

Sample 2 : M25 grade of concrete was used at the joint. The same grade of concrete was also used at a distance of L/3 from the column in the direction of beam with the sole purpose of increasing the rigidity in the direction of beam. M15 grade of concrete was used in the rest of specimen. In order to study its behaviour, the load-displacement and stress-strain curves are drawn below

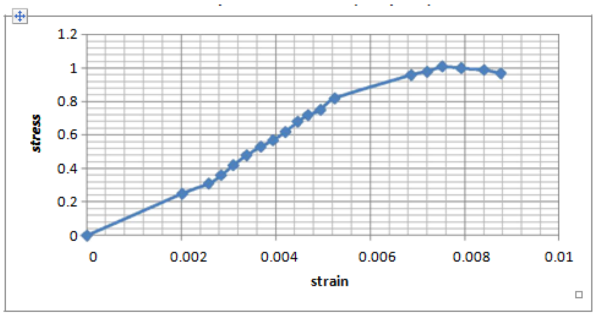


load- displacement curve (sample 2)



stress-strain curve (sample 2)

Sample 3 : M20 grade of concrete @ joint and M15 grade of concrete in rest of specimen excluding joint. The testing of sample was conducted after 7 days and 28 days with suitable arrangement for fixity. The load-displacement and stress-strain curves are given below:



Stress-strain curve (sample 5)

In each graph, load is expressed in KN, displacement in mm and stress is expressed in KN/m2. Sample 1 was tested after 28 days

Sample 2 and 5 were tested after 7 days Sample 3 and 4 were tested after 7 days

From the above results it is clear that:

- By increasing the grades of concrete at beam-column junction, there is significant increase in load at failure. Using M25 grade of concrete at junction with rest of mix as M15 increased the load at failure to about 8% when compared with M20 mix at junction and M15 in the remaining.
- Using M25 concrete grade at junction and one third of the length of beam (M15 in the remaining) increased the load at failure to about 15% when compared with M20 mix at junction and one third of the length of the beam (M15 in the remaining) .
- Junctions with higher concrete grade at junction are free from cracking
- More the rigidity of the beam-column junction more is the load at failure and thus more efficient is the beam-column junction.
- Thus the efficiency of beam column-junction can be enhanced by using higher concrete grade at junction.

SAMLE	SAMPLE 1	SAMPLE 5	SAMPLE 2	SAMPLE 3	SAMPLE 4
PEAK LOAD	126 KN	116 KN	80 KN	85 KN	101 KN

References :

[1]. Seismic Behavior of Beam Column Joints in Reinforced Concrete Moment Resisting Frames
by Dr.S.R.Uma

[2]. SHEAR IN BEAM-COLUMN JOINTS IN SEISMIC DESIGN OF STEEL FRAMES
Krawinkler, H

[3]. BEAM—COLUMN JOINTS
W.R. Walpole*

[4]. Seismic Resistance of Reinforced Concrete Beam-Column Joints
by Norman W. Hanson, Harold W. Conner

[5]. Experimental Investigation of FRP-Strengthened RC Beam-Column Joints
Costas P. Antonopoulos1 and Thanasis C. Triantafillou, M.ASCE2

[6]. Shear strengthening of beam-column joints
Ahmed Ghobarah, , A. Said

[7]. SEISMIC REHABILITATION OF BEAM-COLUMN JOINTS USING FRP LAMINATES
GHOBARAH & A. SAID

[8]. SEISMIC BEHAVIOUR OF R.C. BEAM-COLUMN