To Study and Seismic Analysis of Beam-Column Joint using ANSYS

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Abstract— the biggest impact of earthquake on a building structure is at the beam column joint. Many researchers have tried to find solution to minimize the beam-column joint cracks and increase the strength of joint. This article leads to the seismic analysis using ANSYS software. This article is the software analysis of the beam column joint. Proposed analysis is on the same loads as in the experimental methods and compared with the analysis results.

Keywords: ANSYS software, Colony Column, Seismic Analysis of Beam-Column

I. Introduction

An earthquake is a violent earthquake in the earth's crust, sending a series of shock waves in every direction from the place of origin. It is the result of sudden energy release in the earth's earthquake that produces seismic waves. Area seismic activity refers to the frequency, type and size of the earthquake experienced over a period of time. Analysis of the damages currently incurred by the RC frame structures subject to potential earthquake concerns due to the use of concrete that has no adverse impact, soft booster, a weakening upset or inappropriate anchor, Pipe failure causes storage mechanism. An earthquake resistant building is able to accumulate many energy without great failure. It will flow and flow and could be damaged. But it would not fall before very visible signs were placed.

Therefore, people would be able to leave the building before it fell. A damaged earthquake resistant building could be repaired largely of the time.

A. Theoretical Development of the Colony Column

The Co-Column of Beam is the belt-linked belt and column that enables the adjoining members to develop and maintain their ultimate abilities. The sections should have sufficient strength and status to resist the internal forces that emerged from the framed members. Beam Column joints are the weakest link in RC's current resistant frame. The design and details of the beam-column sections boost concrete frames are crucial to ensuring the safety of these structures in earthquakes. Those sections should be designed and detailed to adequately preserve the integrity of the sections to connect the strength and end-of-the-art capacities of the beams and columns; Prevent excessive degradation of seismic loading compatibility by filtering the concrete composition and by preventing losing a bond between the concrete and long-term behavior and strengthening of a column; and Preventing failed the joint shearing of the joint. As a result, seismic souvenirs of opposite signs are developed in columns above and under the sections while at the same time reversing at all times across the sections.

II. Problem Statement

The effect of earthquake on beam-column joint is quite serious issue now a days, although many researchers have did the research on the beam-column joint by various methods but still there is no efficient solution for the earthquake joints cracks.

III. Objectives of the Paper

The objective of the paper is as follows,

1) To study the experimental analysis of the researcher have did in their research work.
2) To validate the results by using seismic analysis using ANSYS software.
3) To compare the results between experimental and computational analysis.

IV. Methodology

The methodology of the project is as explained in the block diagram below.

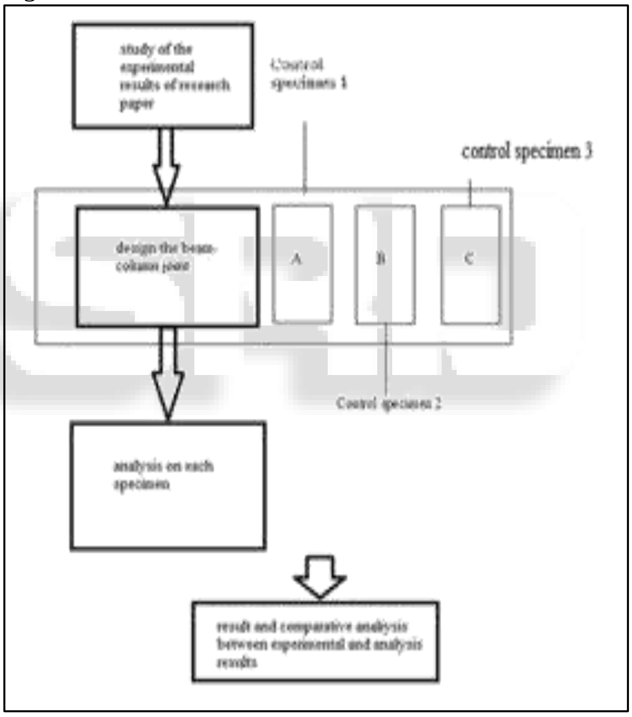

Fig. 4.1: methodology of the project

A. Mechanical properties of reinforcement bars

Bar diameter (mm)	Yield Strength (MPa)	Ultimate Strength (MPa)
8	350	410
14	450	680

Table 1: Mechanical properties of reinforcement bars

V. Experimental Results

The experimental results are plotted as follows, in the form of table, here, first column indicates the specimen of the project, second column gives the load as a input and third column provides the displacement of the for the given input load.

Sr. No.	Specimen (without supporting plates)	Load (KN)	Frequency (Hz)	Displacement (mm)	Stress (MPa)
	A1	2000	5	21.06	3432.7
	B1	2000	10	24.53	3936.7
	C1	2000	15	33.72	5269.7
	A2	4000	5	31.60	5149
	B2	4000	10	36.80	5905
	C2	4000	15	38.67	7904
	A3	6000	5	39.71	8028
	B3	6000	10	40.91	8290.89
	C3	6000	15	42.09	8587.87

Ssr. No.	Specimen (with 90 mm bracket supporting plates)	Load (KN)	Frequency (Hz)	Displacement (mm)	Stress (MPa)
	A1	2000	5	4.46	126
	B1	2000	10	6.73	174.22
	C1	2000	15	22.133	532.84
	A2	4000	5	9.32	252.08
	B2	4000	10	13.46	348.33
	C2	4000	15	44.26	1056.6
	A3	6000	5	13.99	378.07
	B3	6000	10	6.77	174.22
	C3	6000	15	22.133	532.74

Ssr. No.	Specimen (with 180 mm bracket supporting plates)	Load (KN)	Frequency (Hz)	Displacement (mm)	Stress (MPa)
	A1	2000	5	0.6455	113.88
	B1	2000	10	0.766	130.66
	C1	2000	15	1.07	177.69
	A2	4000	5	1.29	226.47
	B2	4000	10	1.52	261.43
	C2	4000	15	2.14	355.49
	A3	6000	5	1.93	339.77
	B3	6000	10	2.28	392.21
	C3	6000	15	3.22	533.29

Table 4: Experimental results of RC beam column joint

VI. DESIGN OF THE PROJECT

A. Design complete assembly (90 mm Angle section)

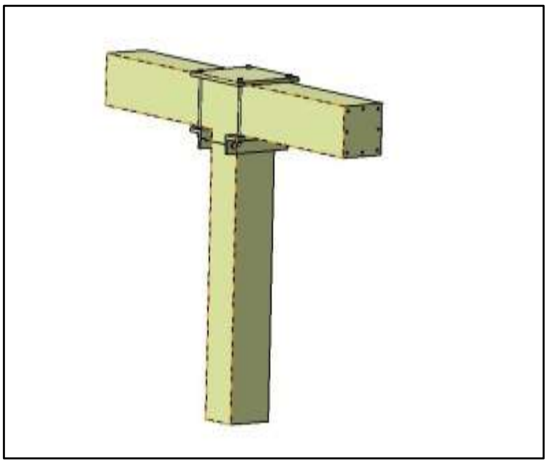

Fig. 6.1: 90 mm Angle section

B. Design complete assembly (180mm Angle section)

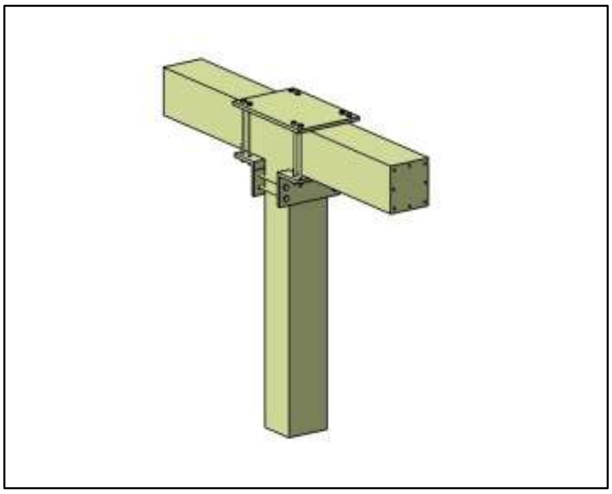

Fig. 6.2: Complete assemblies (180mm Angle section)

C. *Meshing of the structure*

Fig. 8.1: meshing of beam column joint

VII. SEISMIC ANALYSIS ON SPECIMENS

A. *A1 (Control specimen 1)*

- Load: 31.3 KN
- Displacement: 12.187 mm

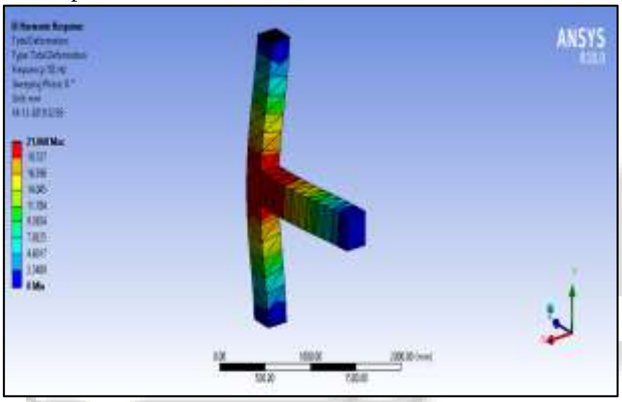

Fig. 9.1: Displacement of the specimen A1 (control specimen 1)

B. *B1 (Control Specimen 2)*

- Load: 21.1 KN
- Dispalecement:13.057mm

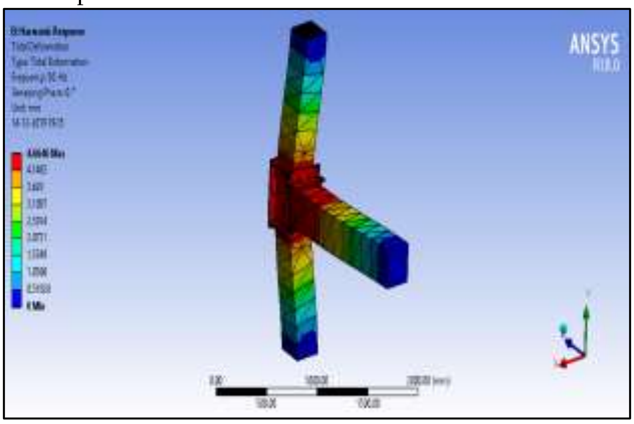

Fig. 9.2: Displacement of the specimen B1 (control specimen 2)

C. *C1 (CS-1 with 180mm angle section)*

- Load: 50.2 KN
- Displacement: 8.94 Mm

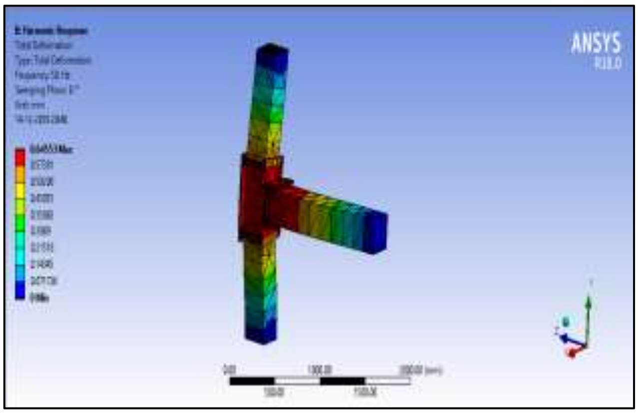

Fig. 9.3: Displacement of the specimen C1 (CS-1 with 180mm angle section)

VIII. CONCLUSION

The application of non-linear finite elements model presented in this study yielded satisfactory prediction of load-carrying capacity and load-deflection response for experimentally tested specimens strengthened by angle plates of various dimensions. Load-displacement graphical analysis and experimental results for studied specimens were simulated accurately using ANSYS package.

The level of applied load to the beam, longitudinal steel ratio in the beam and compressive strength of the studied specimens had a significant effect on their ultimate load, ultimate displacement and stiffness degradation before strengthening, to different degrees. Applying the strengthening scheme reduced the effect of these parameters. Increasing the length of plates in such strengthening scheme led to a further improvement in resisting higher levels of loads applied to the beam column joints.

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