SEISMIC PERFORMANCE OF EXTERIOR & CORNER NON-DUCTILE BEAM COLUMN JOINTS IN GRAVITY LOAD DESIGNED REINFORCED CONCRETE BUILDINGS

WAEL HASSAN

Advised By

Prof. JACK MOEHLE

PART 1

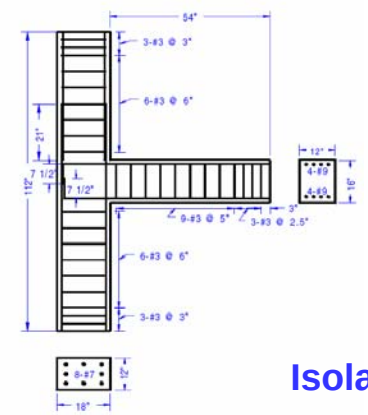
LITERATURE STUDY

Part 1: Background & Review of Available Literature

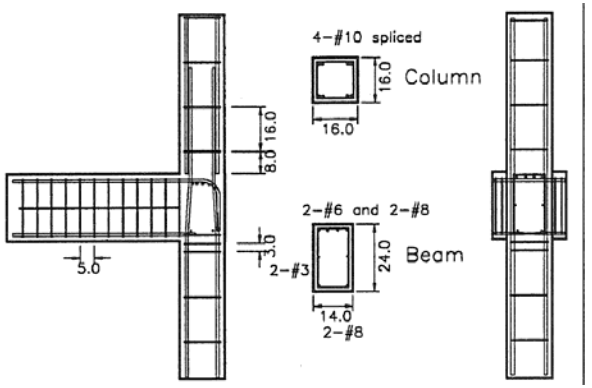
1- Background, past Earthquake Joint Failures
2- Tests on Non-Ductile Exterior Joints
3- Tests on Non-Ductile Corner Simulated Joints
4- Tests on Non-Ductile Corner Joints
5- Modeling Non-Ductile Exterior Joints
6- General Experimental Conclusions

Past Earthquakes Joint Failures

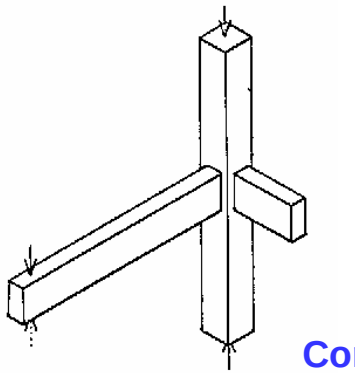
Previous Joint Tests



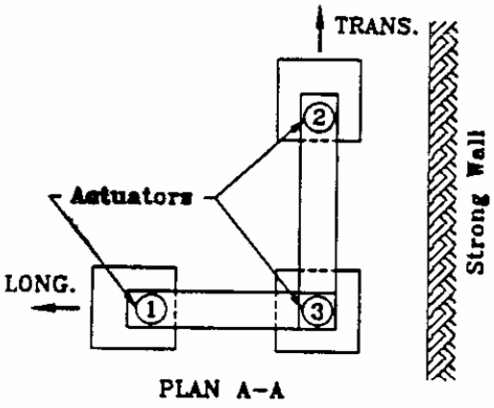
Isolated Exterior



Exterior with 2 Stubs

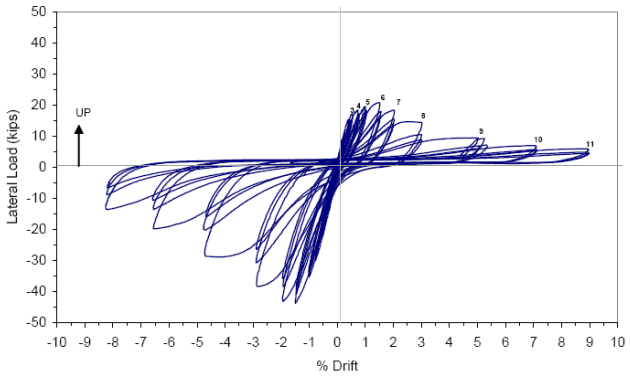


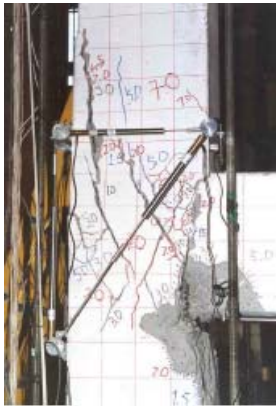
Corner Simulated

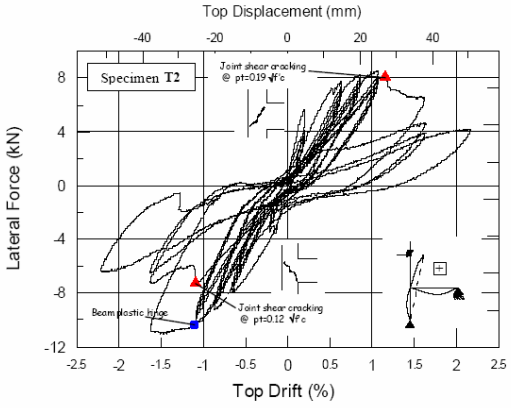


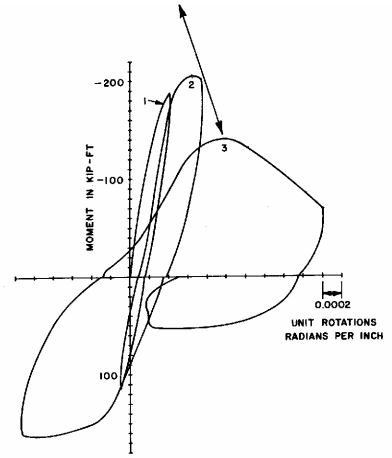
Corner

Sample Exterior Joints Test Failure

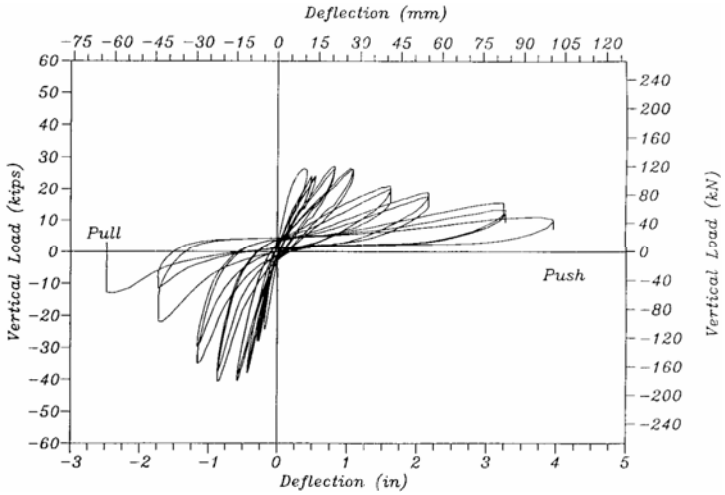


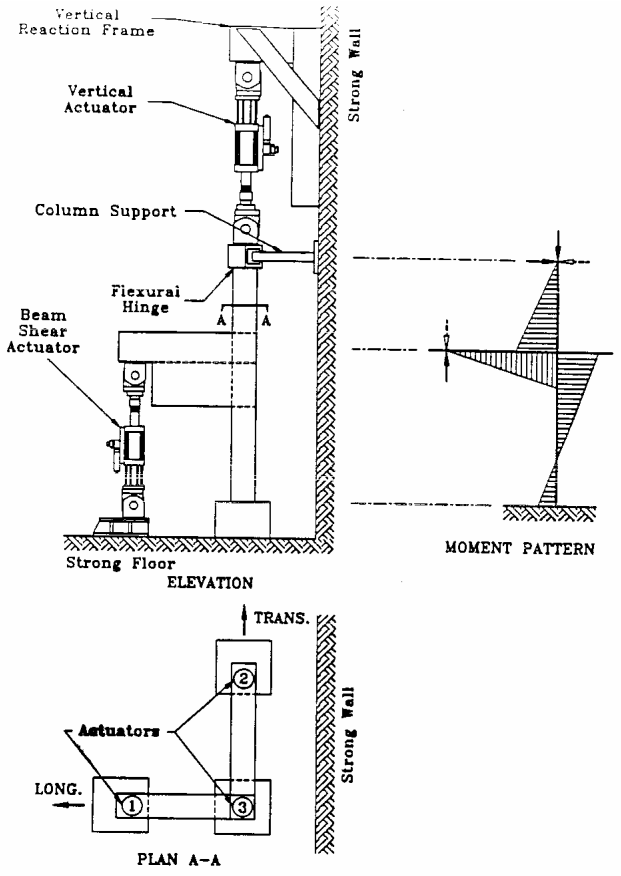






Corner Joint Test (UCSD)

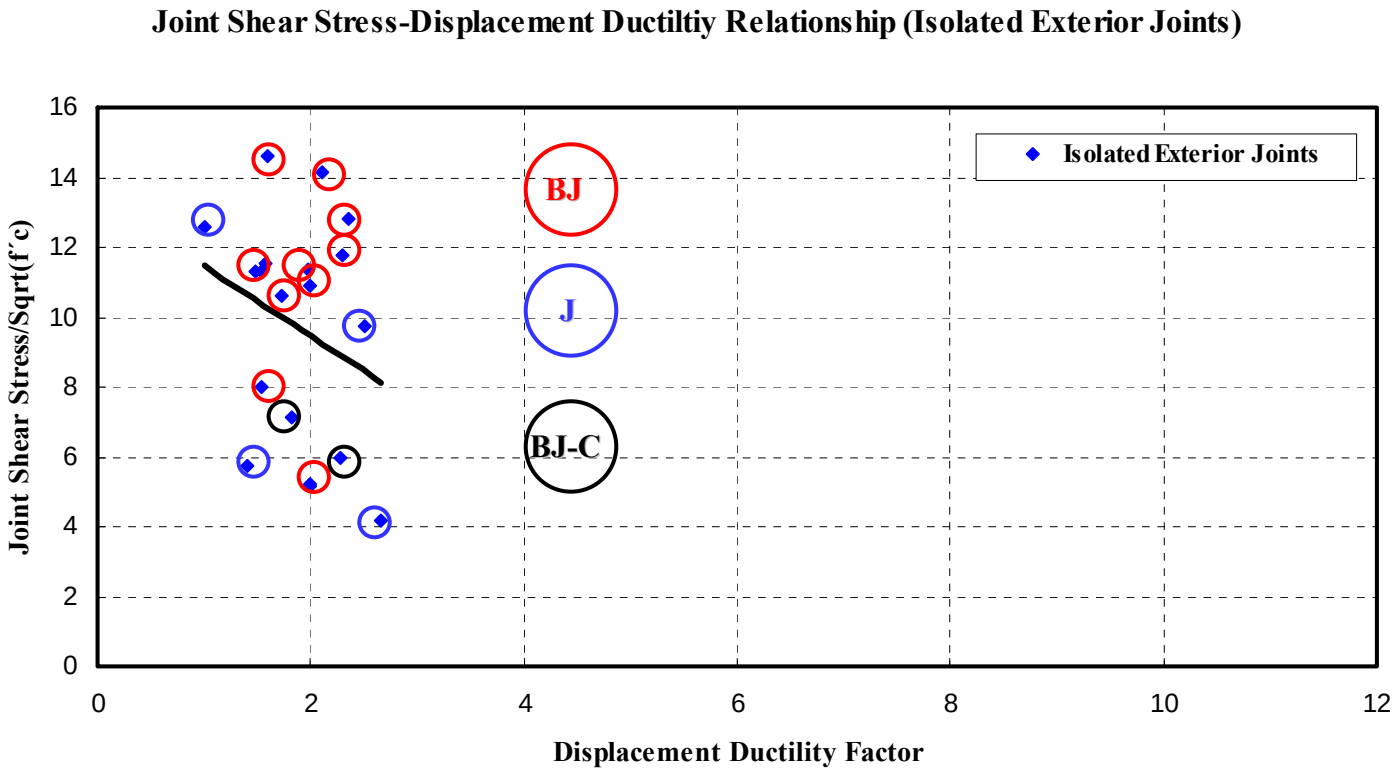




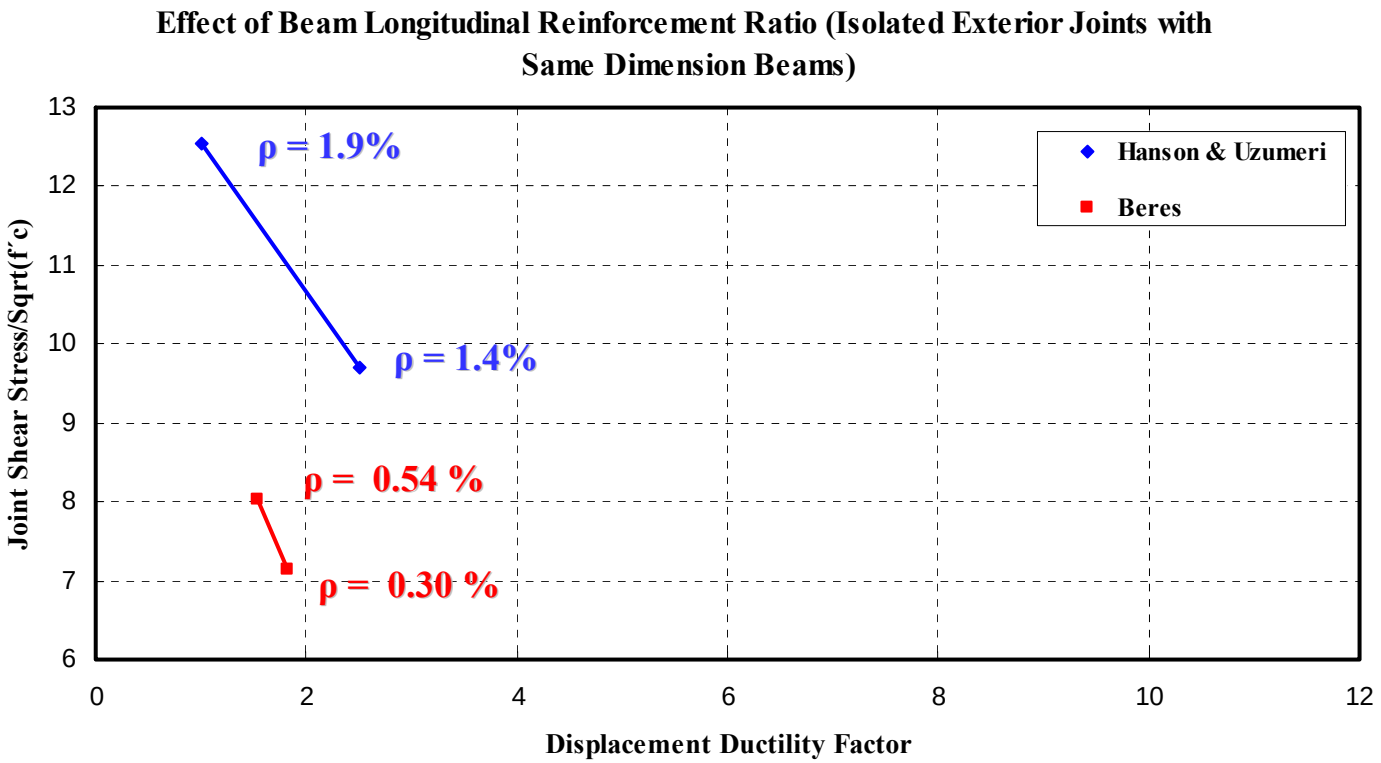
PART 2

Joint Shear Strength Degradation Trends

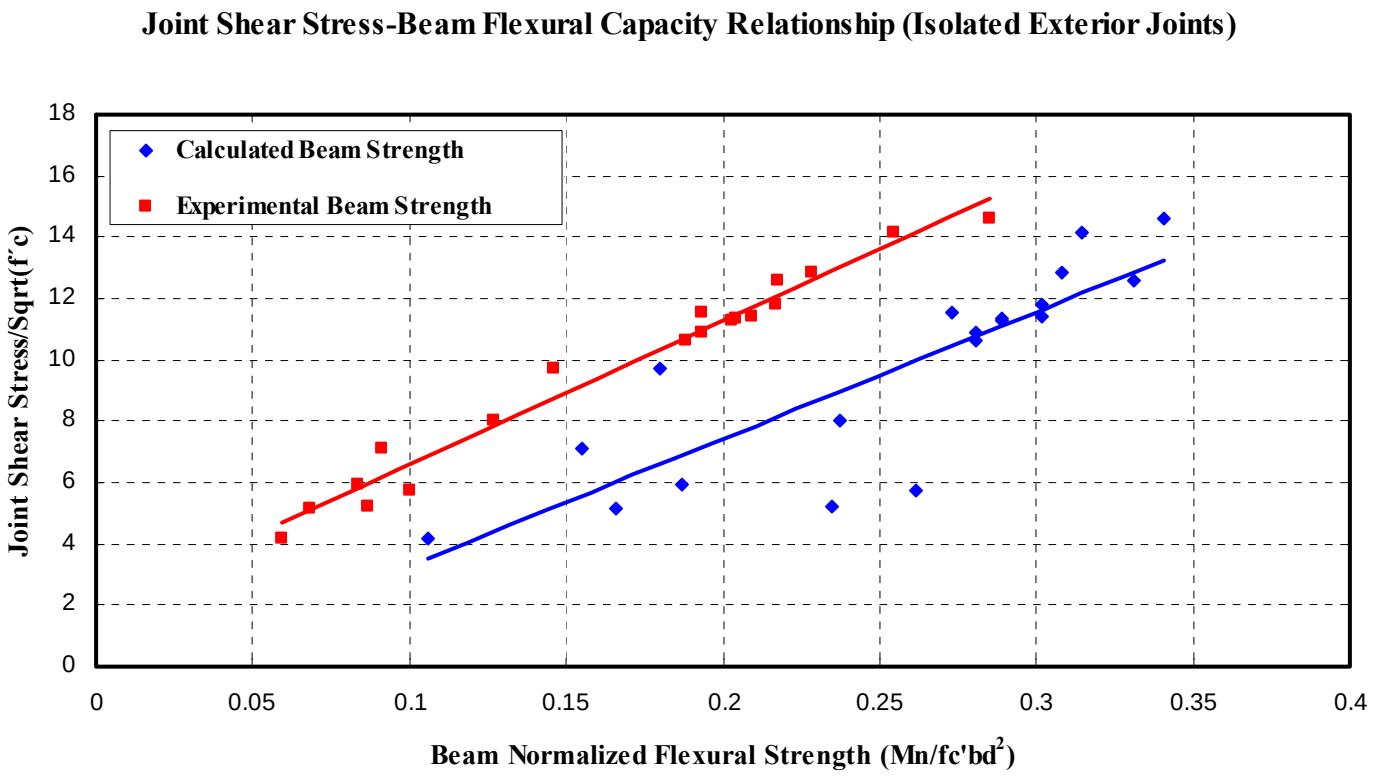
NON-DUCTILE ISOLATED EXTERIOR JOINTS



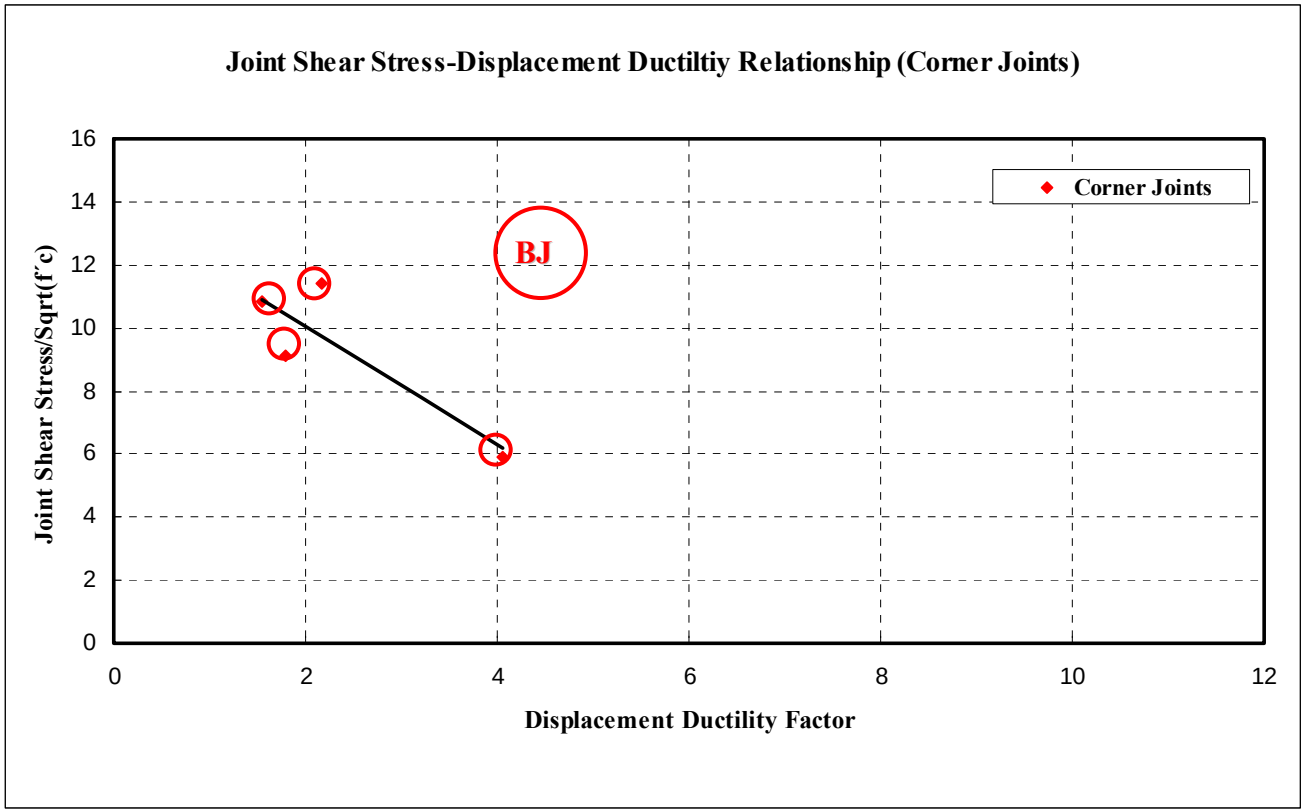
NON-DUCTILE ISOLATED EXTERIOR JOINTS



NON-DUCTILE ISOLATED EXTERIOR JOINTS



CORNER NON-DUCTILE JOINTS



PART 3

TENTATIVE FULL SCALE CORNER BEAM COLUMN JOINT TEST

Drawbacks & Unanswered Questions in Previous Tests

1- Definite Result about the Effect of High Axial load

3- Reliable Shear Strength Degradation Models for Non-ductile Joints

4- Reliable Corner Joint Test and Modeling

5- Non-ductile Joint Shear Strength, for varying Joint Aspect Ratio

6- Effect of Beam to Column Width Ratio, (Joint Masking Area)

7- Effect of Slab Presence for non-ductile joints

8- Realistic Representation of Biaxial Loading

9- Axial Load Residual Capacity

Suggested Test Parameters

1- Axial Load Level, 0.15 fc'Ag vs 0.30 fc'Ag

2- Failure Mechanism, Joint Shear failure vs Joint Shear Failure after Beam Yielding

3- Beam to Column Flexural Strength $\sum M_c / \sum M_b$,
Strong Column Weak Beam vs Strong Beam Weak Column Conditions.

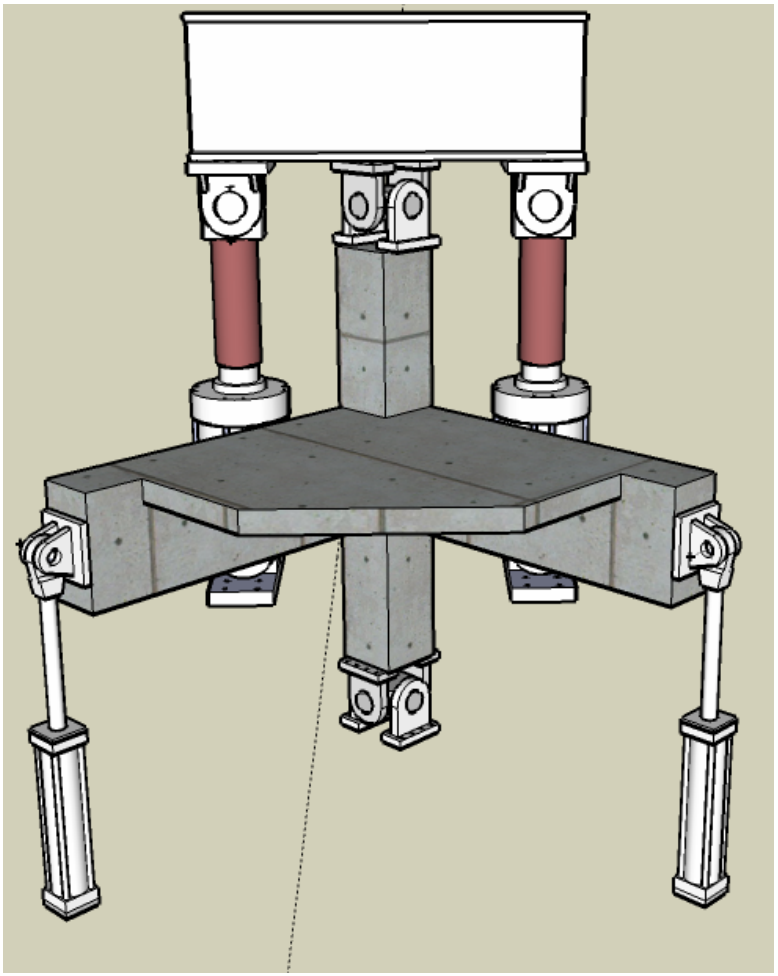
4- Joint Shear Strength, through Joint Aspect Ratio, 1 vs 1.92

5- Beam to Column Width Ratio, (Joint Masking Area), 0.9 vs 0.55

6- Effect of Slab Presence

-Test Setup

- -Two 120 Kips Beam Act.
- -Two 1000 Kips Axial Actuators
- -Slab Included
- -Variable Axial Load
- -Realistic Bidirectional Loading



-Specimen Design

Collaboration with Sangjoon