SEISMIC PERFORMANCE OF WEAK-BASE STRONG-COLUMN FRAME SYSTEMS

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PROJECT OBJECTIVES
1. Investigate the performance of Weak-Base Strong-Column frames
2. Test the versatility of this approach in exposed base connections
3. Define the importance of the proper characterisation of true base response with respect to the current modelling assumptions

1. INTRODUCTION
- Current design practice for Steel Moment Resisting Frames (SMRFs): Strong-Base Weak-Column
- Large scale tests [2] reveal excellent dissipative properties of exposed base connections
- Appealing approach for seismic design: Weak-Base Strong-Column
- Explore the effect of change in connection strength on structural performance
- Need to characterise connection’s response

3. CALIBRATION OF HYSTERETIC MODELS
- Calibration of Cyclic test data [2] to ModIMK Pinching Model in OpenSEES
- Implemented in column bases of 4 storey building model
- Important to capture realistic behaviour of bases and assess the true structural response

4. PERFORMANCE LEVELS & 4 STOREY FRAME

5. MULTIPLE STRIPE ANALYSIS

6. CONCLUSIONS
- Connections with 80% of strength show comparable performance to connections designed to current codes (S1 strength level)
- Fixed assumption overestimates response and could compromise serviceability and safety while Pinned is overconservative
- Ductility increase in building if connection designed to yield
- Soft story like collapse for weak bases approach
- Weak base design leads to economic savings (smaller and cheaper base connections)

REFERENCES