Deformable Connection For Earthquake-Resistant Building Systems

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Motivation

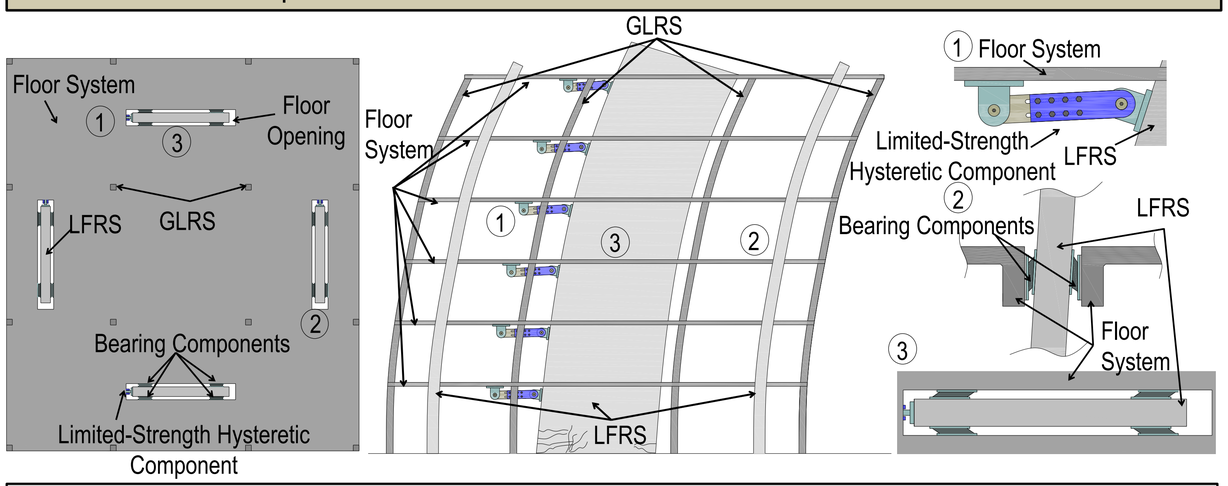
Limit the lateral forces transferred from each floor of the flexible gravity load resisting system (GLRS) to the stiff lateral load resisting system (LFRS) of earthquake-resistant building systems.

Objective

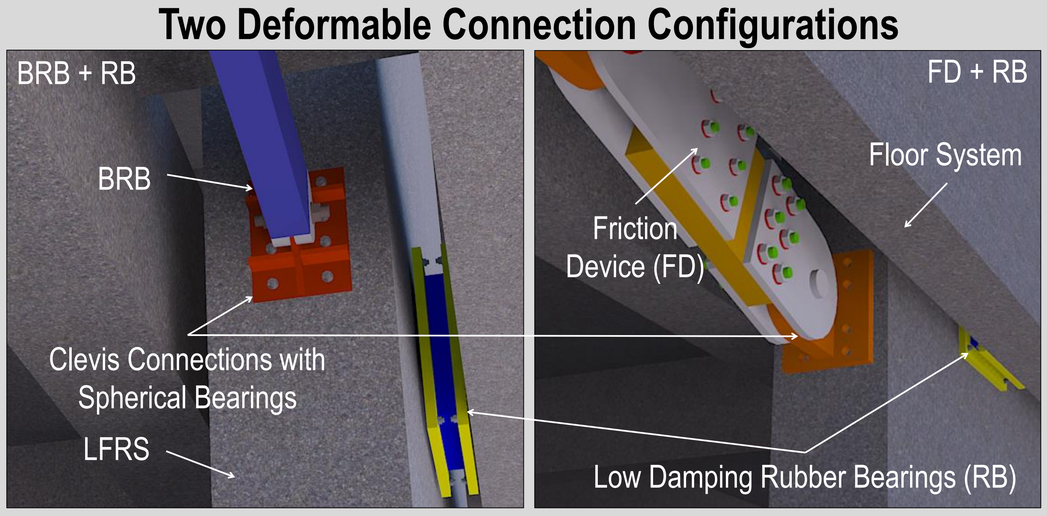
Development, design, and experimental validation of deformable connection that limits the lateral forces transferred from the GLRS to the LFRS.

Concept

- Floor openings allow the relative motion between LFRS and GLRS.
- LFRS is connected to GLRS using deformable connections that consist of two components:
  1. Limited-strength hysteretic components limit the lateral forces.
  2. Bearing components provide the LFRS out-of-plane stability and deformable connection post-elastic stiffness.

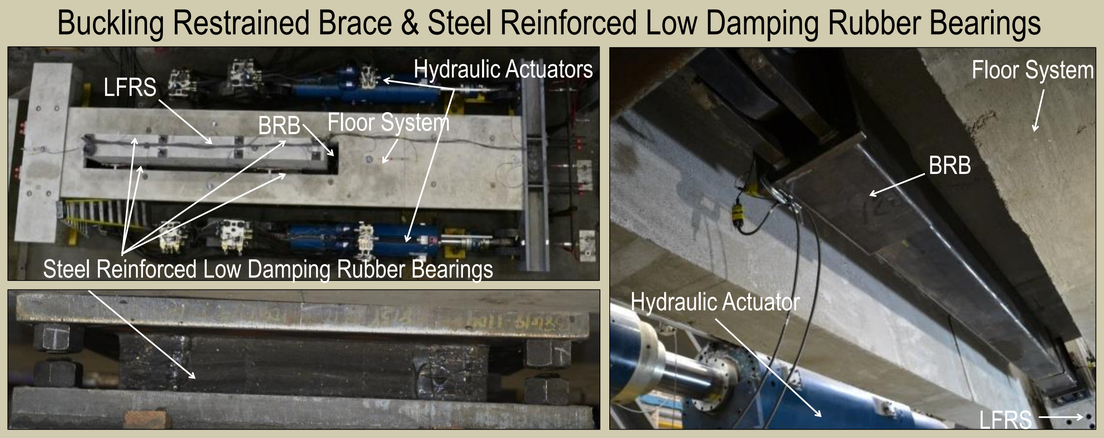


Two Deformable Connection Configurations

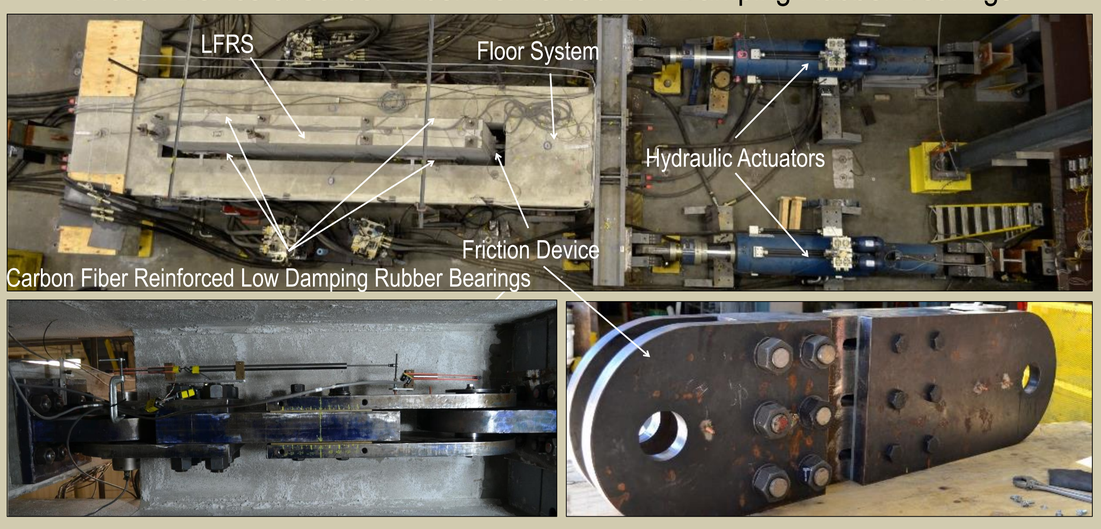


Full-Scale Experimental Set-Up

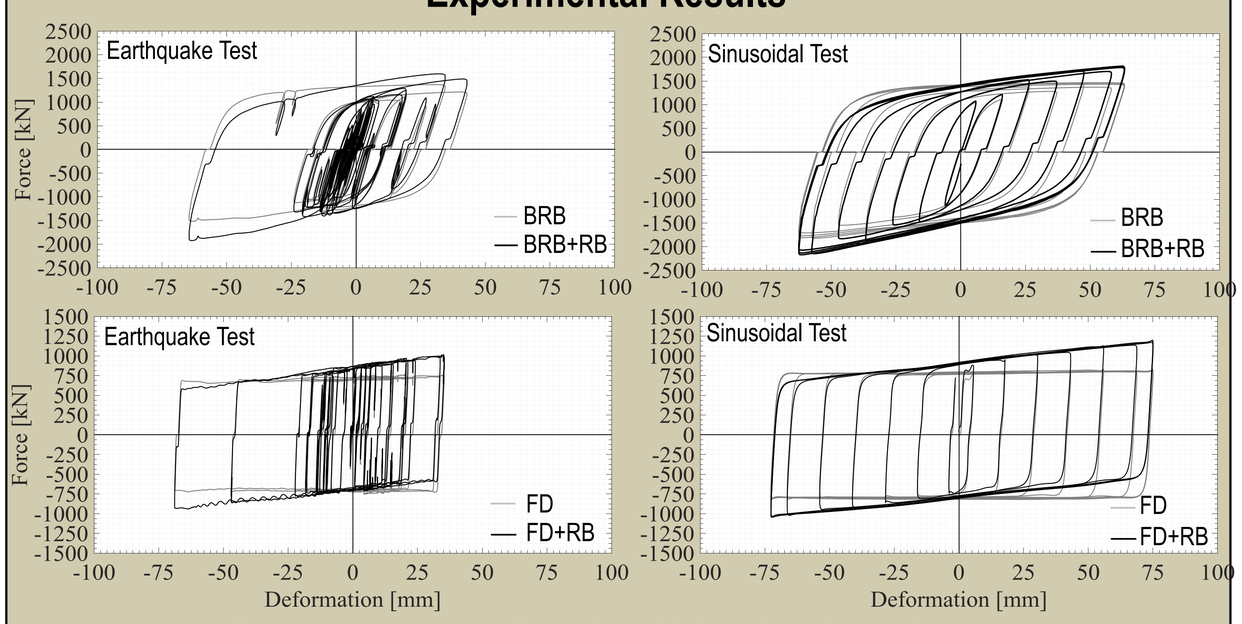
Buckling Restrained Brace & Steel Reinforced Low Damping Rubber Bearings



Friction Device & Carbon Fiber Reinforced Low Damping Rubber Bearings

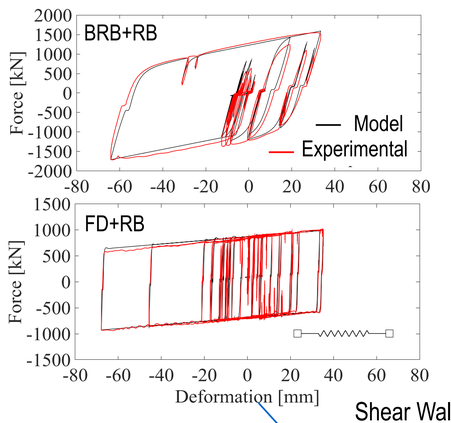


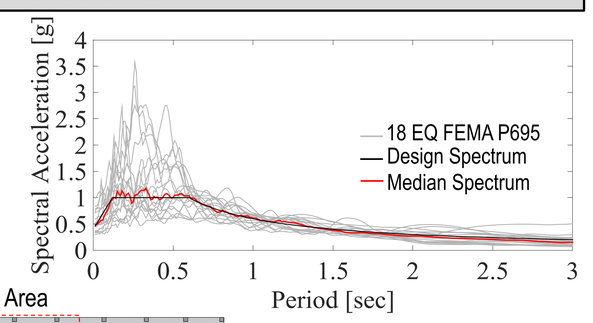
Experimental Results

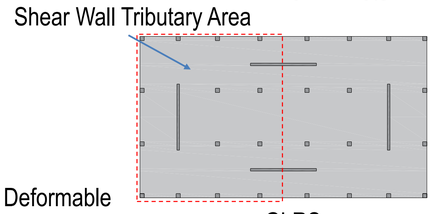


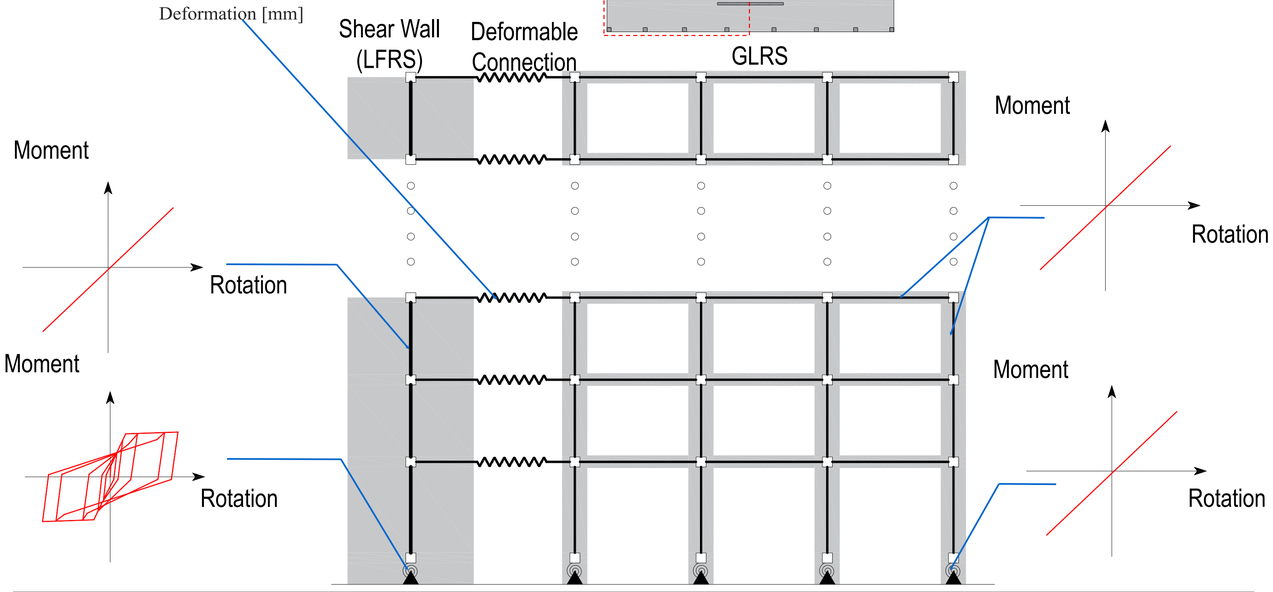
- Design, installation, and inspection feasibility of full-scale deformable connections and their attachments.
- Stable hysteretic response under large cyclic deformation demand.

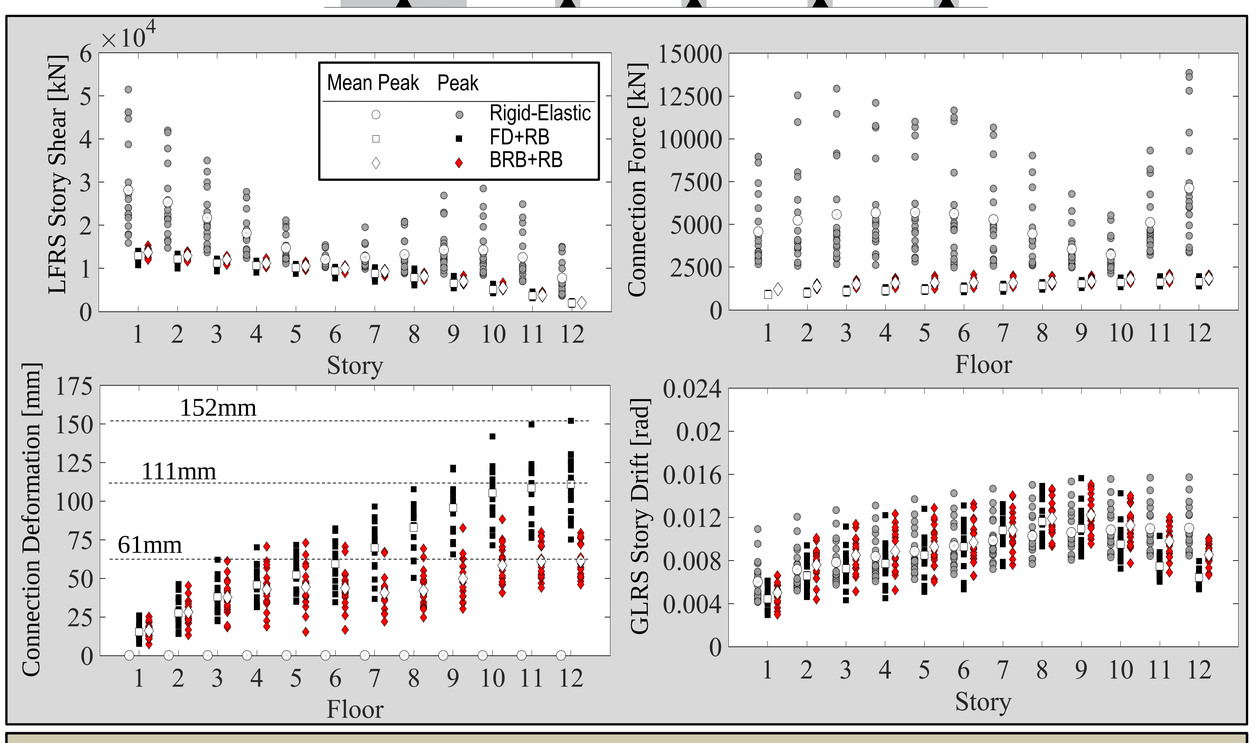
Numerical Simulations











Conclusions

The use of experimentally validated deformable connections, instead of rigid-elastic connections, limits the transferred forces from the GLRS to the LFRS, the LFRS story shears, and their dispersion, without increasing the GLRS story drift under feasible deformable connection deformation demand.