Experimental Seismic Test of Drywall Partition Walls with Improved Detailing for Damage Reduction

NHERI TallWood

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Introduction

- In the NHERI TallWood project, post-tensioned rocking walls made of CLT, being developed as a lateral system for tall timber buildings.
- Drywall partition walls are drift sensitive components, which are susceptible to damage at low drift intensities
- Post-tensioned CLT rocking walls as a lateral load resistant system can sustain enormous drift demands with little damage.
- Drift induced damage in drywall partition walls needs to be reduced in buildings utilizing rocking wall lateral system to achieve overall seismic resiliency

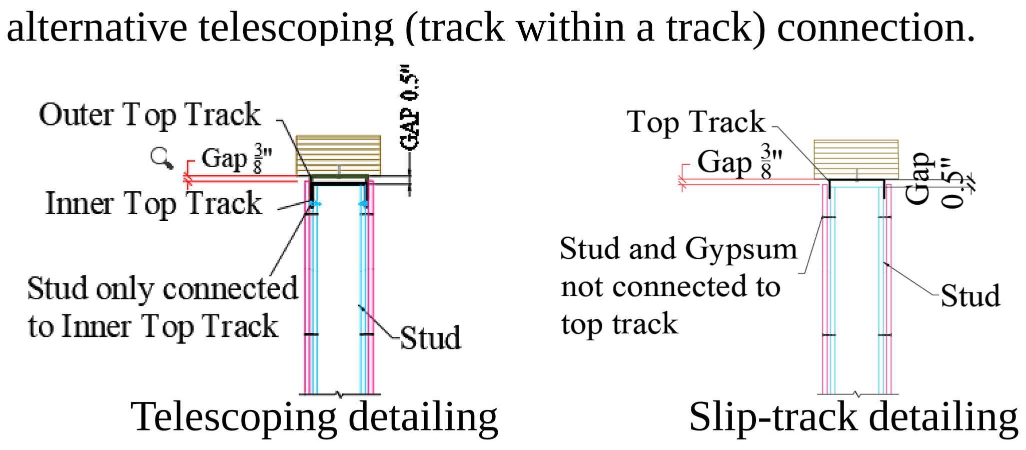
Objectives

The main goal of this study is to find best configuration of drywall partition walls which can sustain high amount of drift.

Parameters which investigated in this experiment:

- **Phase 1:**

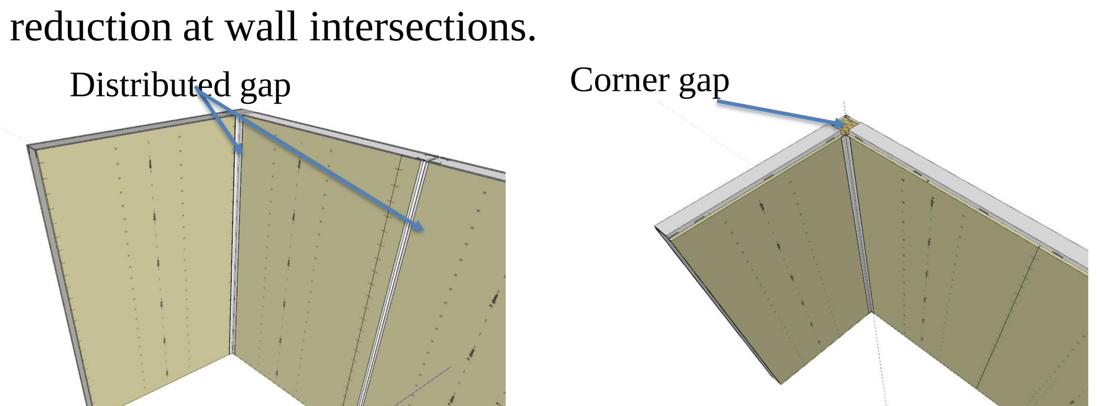
✓ Slip behavior of a conventional slip-track connection and an alternative telescoping (track within a track) connection.



Telescoping detailing　　Slip-track detailing

✓ Assess the influence of out-of-plane loading on the in-plane resistance

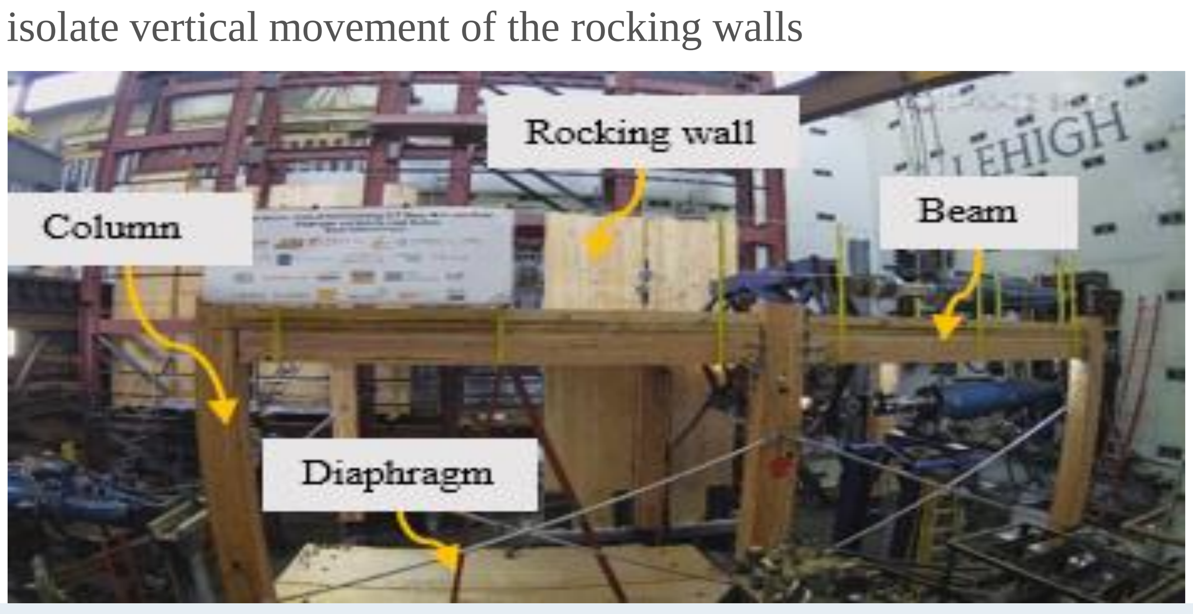
- **Phase 2:** Use of corner gap (open corner) detailing and distributed gap (0.5” expansion joints) detailing for damage reduction at wall intersections.



Testbed Structure

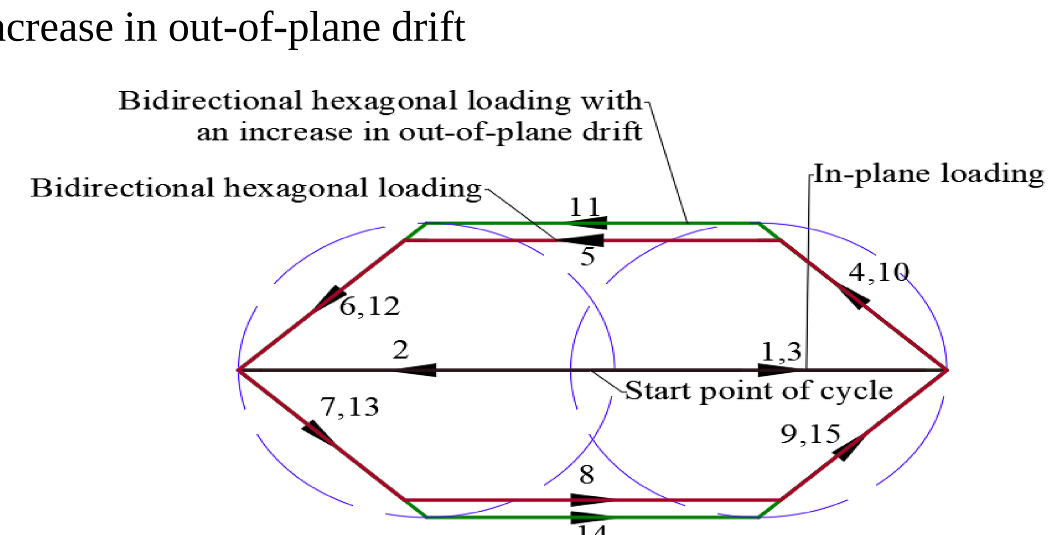
For evaluating objectives on drywall partition walls, a 2 bay by 1 bay (30ft by 15 ft.) CLT post-tensioned rocking wall sub-assembly with gravity framing have been used.

The connection of the wall and collector beam was designed to isolate vertical movement of the rocking walls



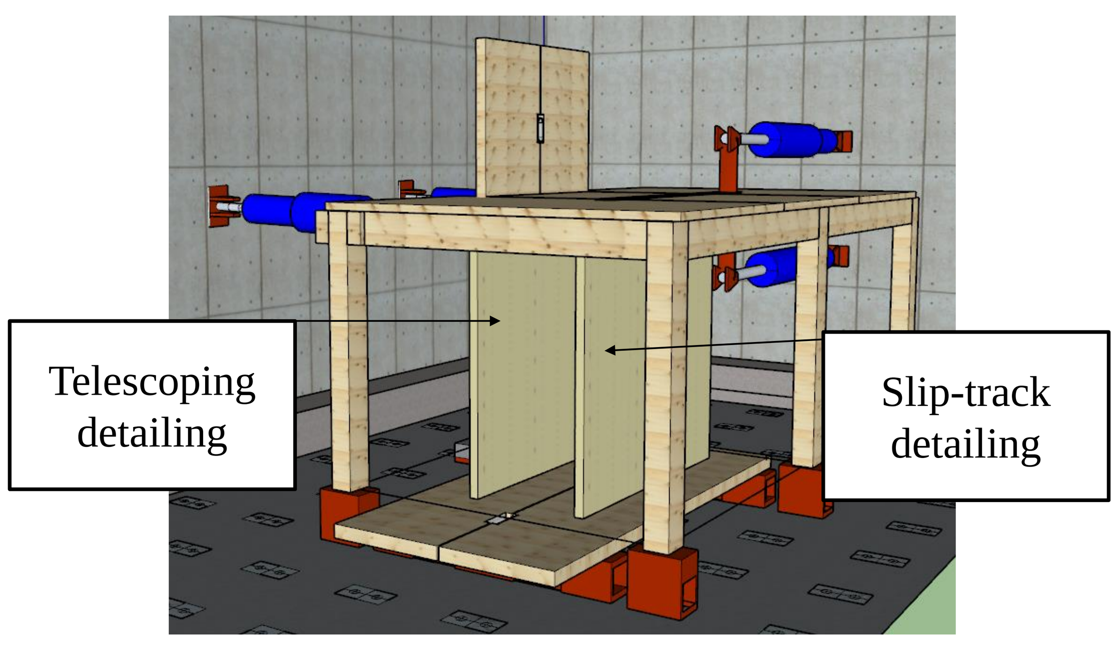
Loading Protocol

Bi-directional: Three sub-cycles in each stage: in-plane, bidirectional hexagonal, and bidirectional hexagonal with an increase in out-of-plane drift

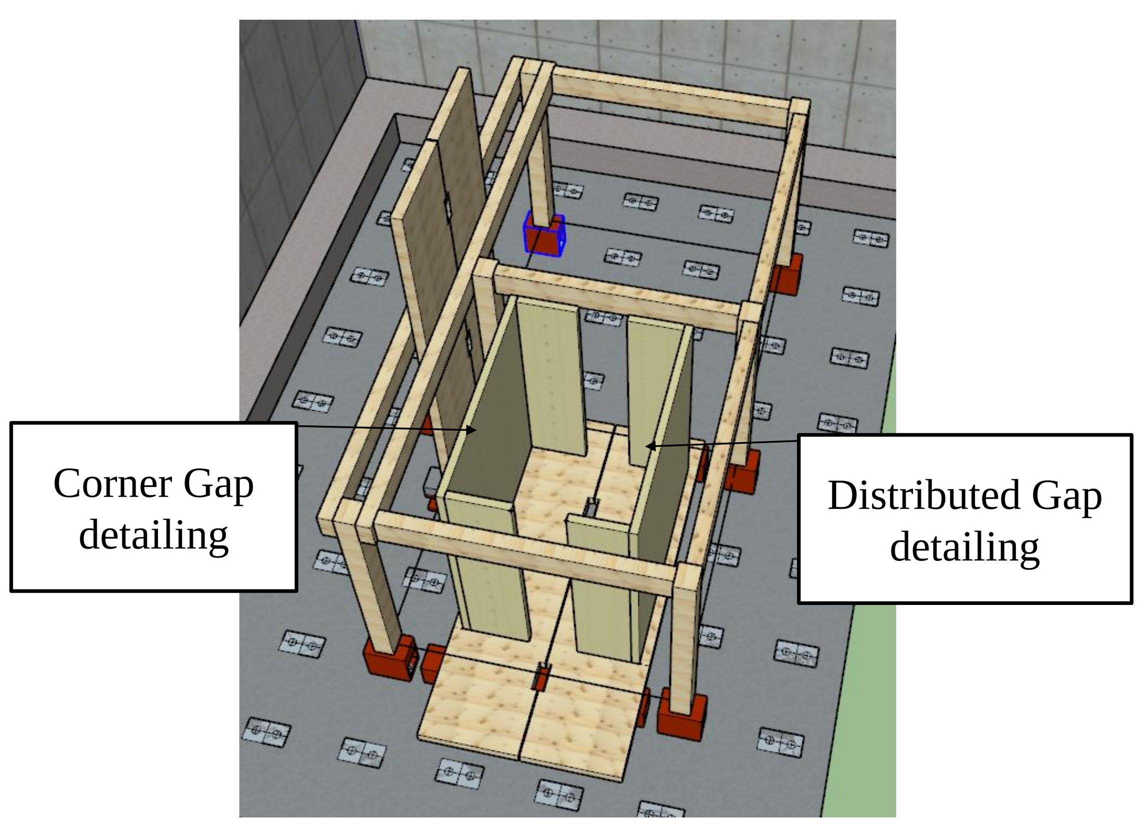


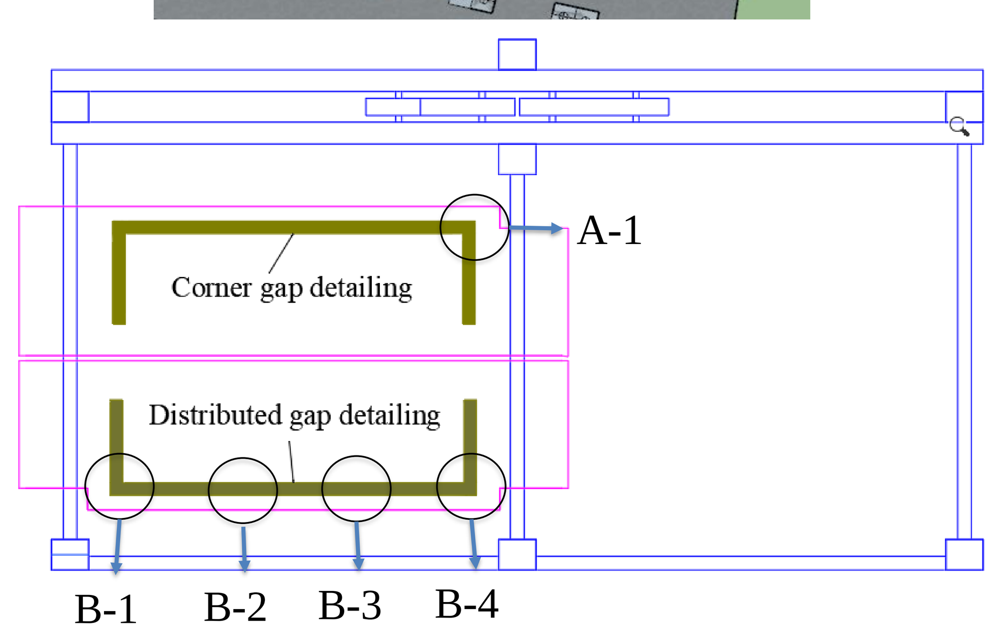
Experimental Program

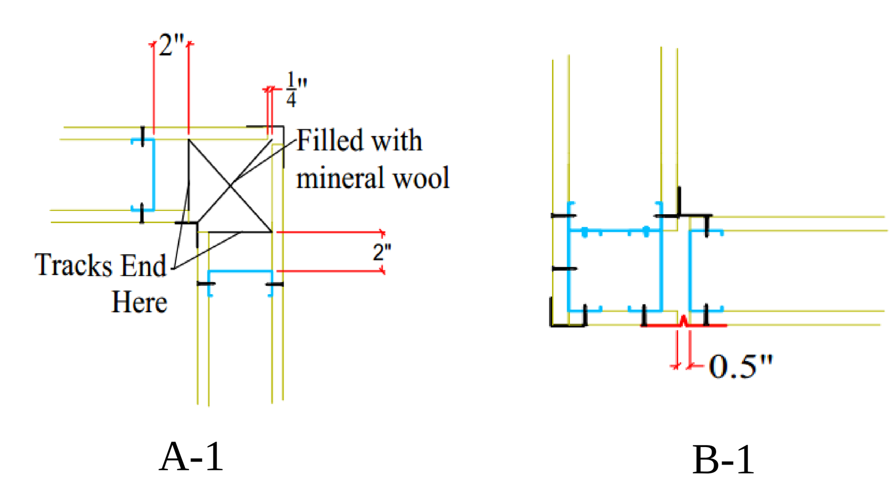
- **Phase 1:**

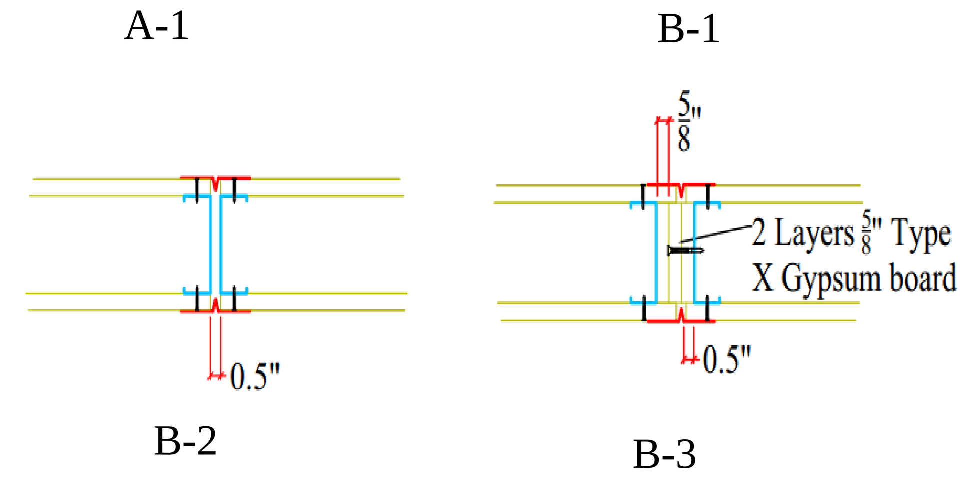


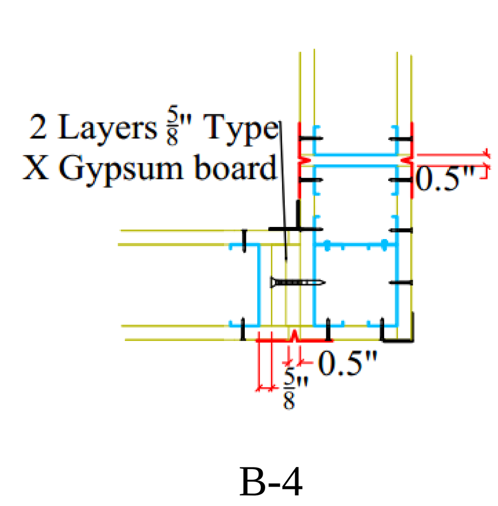
- **Phase 2:**







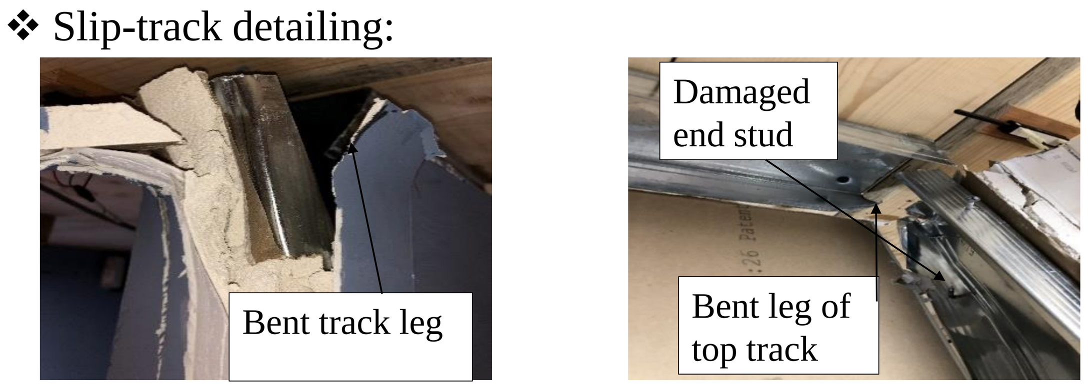




Results

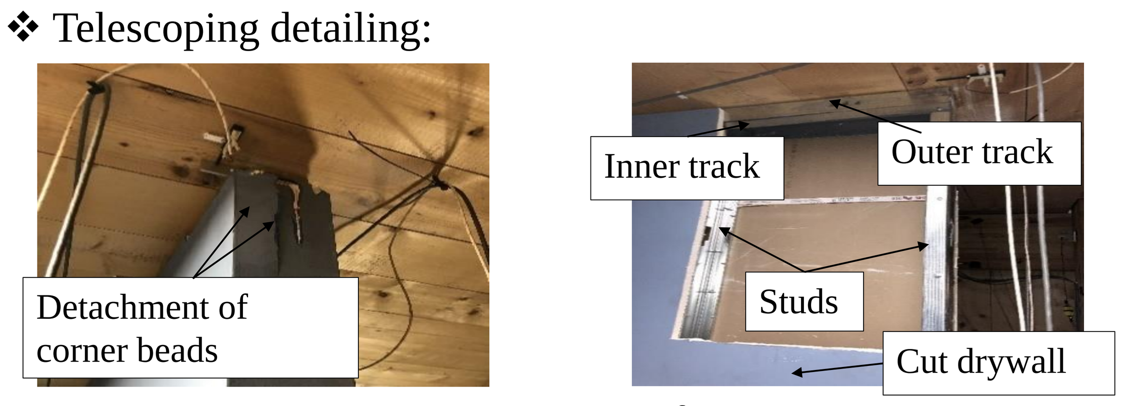
- **Phase 1:**

❖ Slip-track detailing:



3.2% drift　　After test

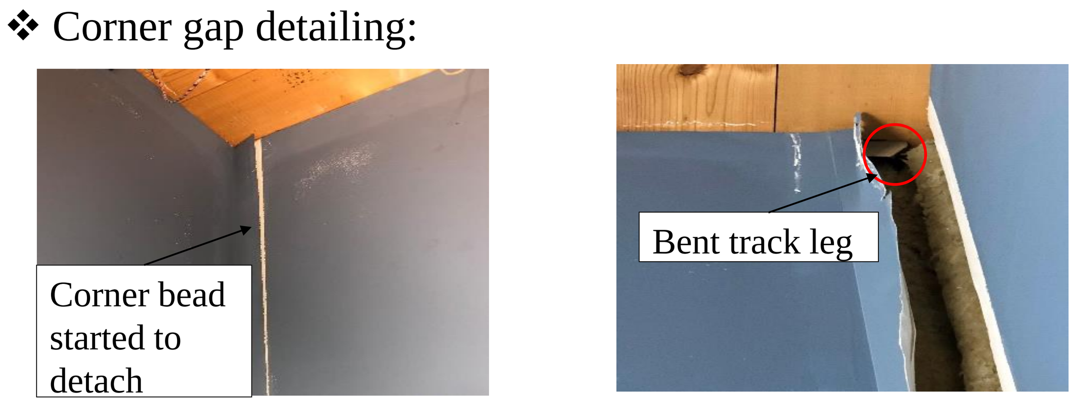
❖ Telescoping detailing:



1.64% drift　　After test

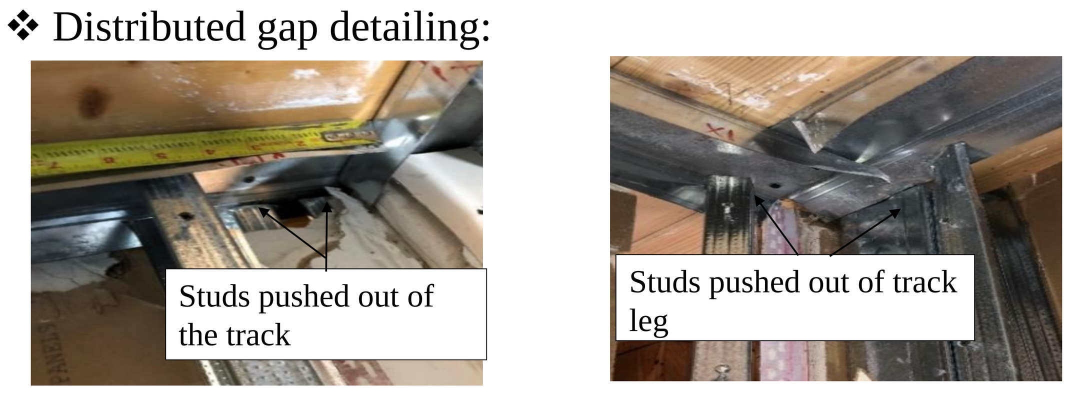
- **Phase 2:**

❖ Corner gap detailing:



0.43% drift　　2.56% drift

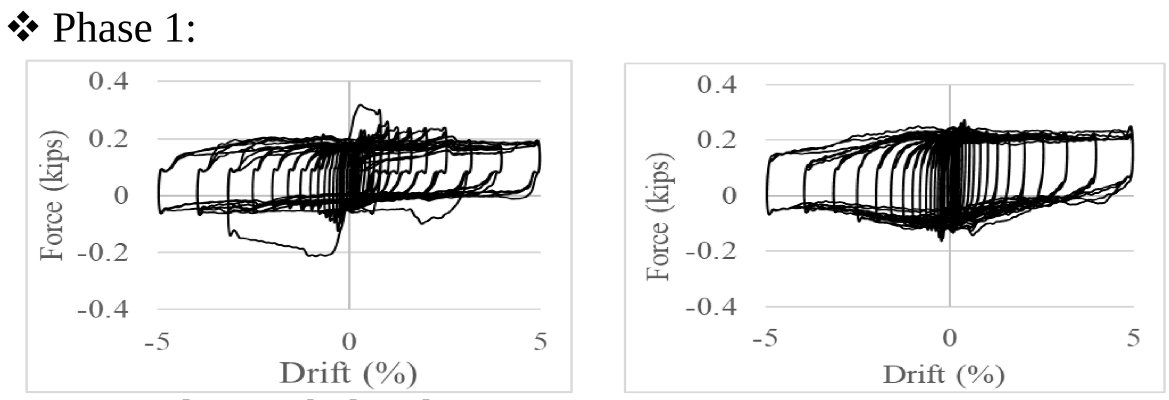
❖ Distributed gap detailing:



After test fire-rated　　After test non-fire-rated

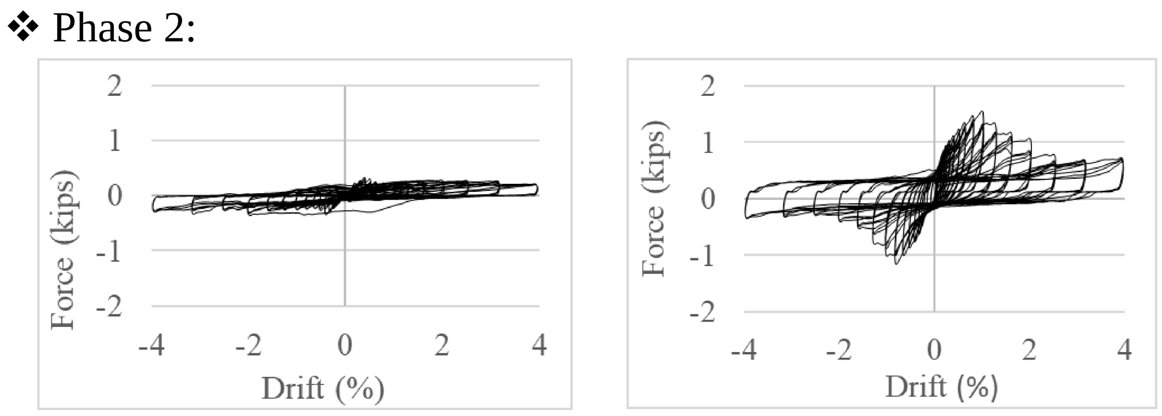
- **Hysteresis Response of Drywall Partition Walls**

❖ Phase 1:



Slip-track detailing　　Telescoping detailing

❖ Phase 2:



Corner gap detailing　　Distributed gap detailing

Conclusion

Phase 1:

Telescoping detailing can eliminate damage to the framing of the drywall partition walls, and out of plane drift did not affect the in-plane resistance considerably.

Phase 2:

In distributed gap detailing, only the expansion joints adjacent to the wall intersections were effective, and delayed the damage to about 1% drift.

In corner gap detailing, although the sacrificial corner beads detached at low drifts, wall itself was damage free until high drifts.

This research project is supported by the National Science Foundation through Grant No. CMMI 1635363 and CMMI 1635227. The use of the NHERI experimental facility is supported by the National Science Foundation’s Natural Hazards Engineering Research Infrastructure (NHERI) Program. The authors are grateful for this support. The opinions, findings and conclusions/recommendations expressed herein are those of the authors alone and do not represent the views of the National Science Foundation.

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