

Experimental/Simulation Breakout

*NEESR-GC: Simulation of the Seismic Performance of Nonstructural Systems
Project Meeting*

University at Buffalo, SUNY - April 23, 2010



NEES Nonstructural
Simulation of the Seismic Performance of Nonstructural Systems

Host Institution



Funded by



Comments on Experimental Program

- **Piping Component Subtest**
 - Failures typically occur in main to branch connection with smaller diameter branch failing due to moment/shear
- **Component testing of anchorage/bracing**
 - Hilti has 50 load cells to measure axial force in hangers that could be used for ceiling/pipes

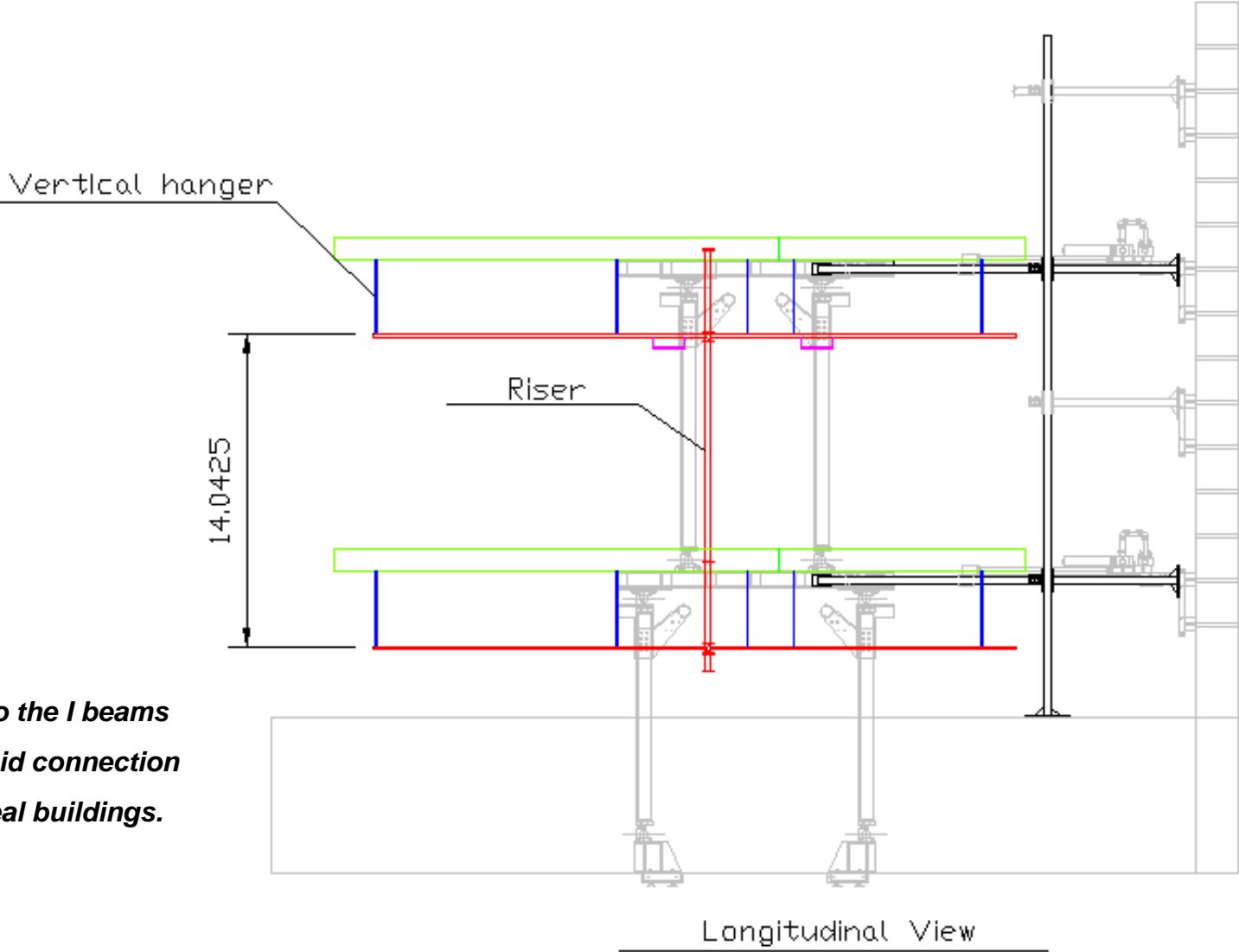


Comments on Experimental Program

- **Piping Subsystems**

- Examine impact with other components – it is not clear that impact will cause leakage
- Ceiling interaction with sprinkler – examine different flexibility for ceiling support
 - Gypsum ceiling would be rigid, but tile would be more flexible
- Need to pay attention to bracing and restraints
 - Near sprinkler head, mainly wire restraints are used and are allowed on last 30 ft of pipe.
- Hanging riser on bottom of first level should be extended down to ground and supported on roller with rigid moment

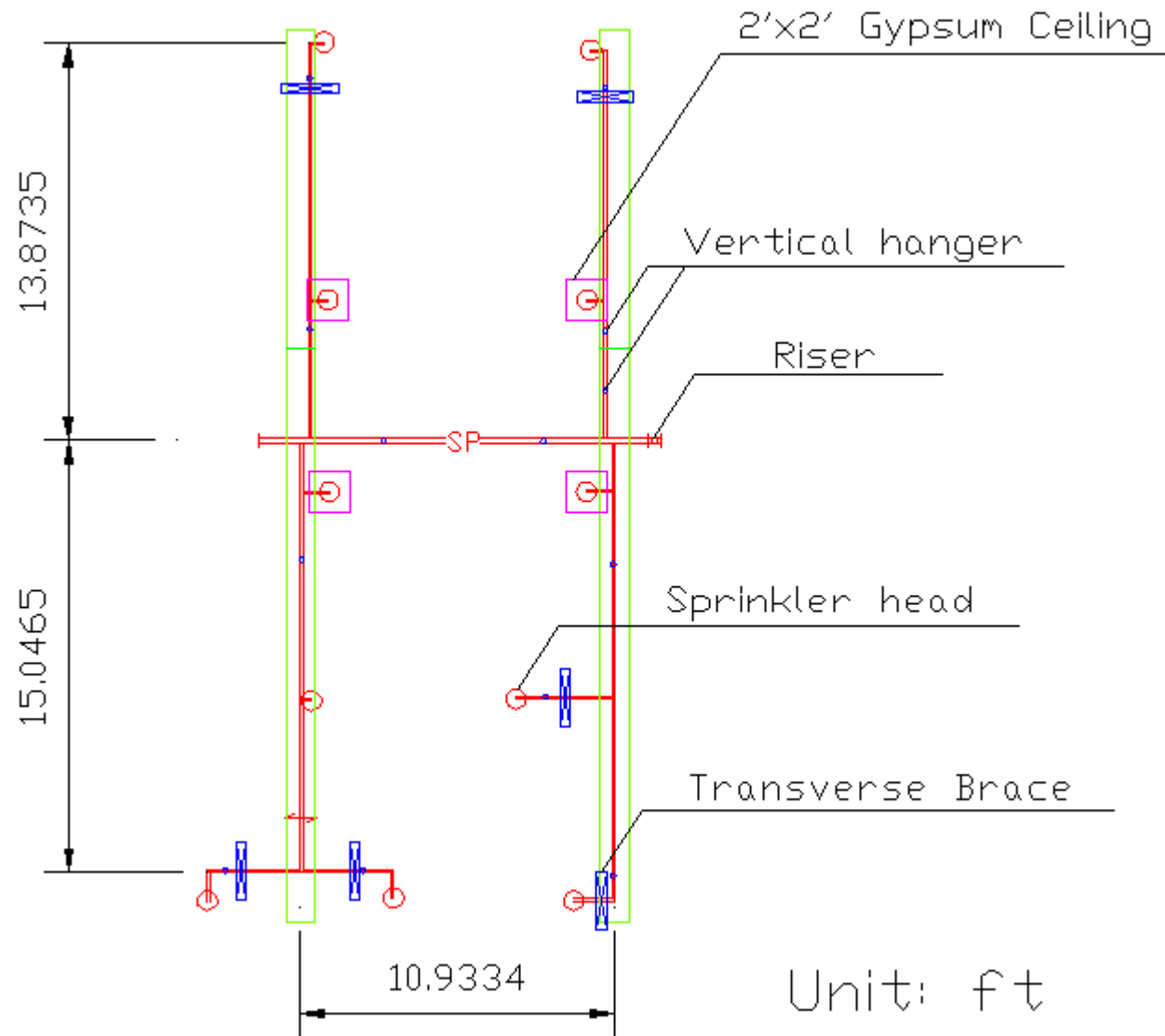
Dynamic Test of Sprinkler Pipina Svstem



•Riser is clamped to the I beams to simulate the rigid connection with floor in the real buildings.



Dynamic Test of Sprinkler Piping System



Shopping Mall in Concepcion, Chile



Simulation discussion

- Piping Data Report
 - append data to include data from 2010 Chile and Baja CA quakes
 - Is data representative of recent construction practices?
- Subassembly models (Partition Wall, Piping)
 - Examine partition wall contribution to collapse mechanism (ATC 63)
 - Parametric study
 - *Buildings from ATC-63*
 - *% of NCS from French et al., layout of NCS from Holmes et al.*
 - Include an out of plane partition wall element
 - Subassembly element calibration limited to experimental data set protocol – ok if mechanism not modified (ie physics still captured)
 - Evaluate partition wall models against other experimental datasets



Simulation discussion

- Ground Motions
 - Avoid scaling by using real motions coupled with artificial ground motions, and/or extend motion selection to other sites
 - *Use Papagiorgio's model*
 - *Generate motion on (M,R) bins for a given return period*
- Piping subassembly tests upcoming @ UB - use models to predict experimental tests
- Use of IDA-accuracy
 - IDA is approximate, can you bound the accuracy?
 - *Scaling of the record - uncharacteristic demands*
 - *Generate IDA curves with return period (x-axis)*