



## **Report Comparing the Hurri-Bolt System to Conventional Hardware for Anchoring Shearwall Ends to Foundations in Multi-Story Wood Framed Construction**

- Purpose:** To compare and evaluate the capacity of conventional hold downs--Simpson HD8A and CS16 coil straps--and the Hurri-Bolt System to resist shearwall overturning.
- Method:** In order to compare the effectiveness of two systems to resist overturning moment of shearwalls a measurement of top floor drift was recorded. Three test walls were built to model a column of shearwalls stacked three stories in height. Eight ball bearing casters with one inch diameter balls were attached to the exterior side of the sheathing at the top of each floor to allow the wall segment to move laterally with minimal resistance. The walls were placed caster side down along the floor horizontally. Hold down hardware was attached to the walls. The walls were attached to a gusseted steel fixture at the end of the wall simulating the foundation. The steel fixture was anchored to the concrete slab of the work area. Steel wedges were driven between the steel foundation jig and the concrete slab to remove any flexure caused by any surface irregularities. The top of the third story was loaded laterally with a hydraulic ram. A calibrated load cell was fixed in between the ram and the end of the wall. Deflection was measured opposite of the ram and load cell along the third floor top plate. The walls were loaded in 100 pound increments with the deflection measured at each increment. The 3 configurations were tested under the same parameters. The data was formatted using an MS Excel Spreadsheet and compared.
- Results:** The shearwall using conventional hardware deflected the most at every load point. The walls with a single three story Hurri-Bolt assembly at each end deflected 25% less than conventional hardware. The walls with a single three story Hurri-Bolt and a single one story Hurri-Bolt assembly at each end deflected to 49% less than conventional hardware.
- Conclusion:** The test results suggest the Hurri-Bolt system is ideal for shearwall anchorage applications. Since the Hurri-Bolt system can be preloaded, it can compensate for wood warping and shrinkage unlike conventional strapping. Because the Hurri-Bolt assemblies are preloaded, the sheathing does not have to yield before the system is tensioned. In our tests, this feature reduced the initial drift by as much as 70%. That significant story drift must occur before conventional strapping is engaged. The 'real world' application of the data from this test is minimal given the fact that each floor system is interrupted by a horizontal diaphragm. However, the observation that Hurri-Bolt System is ideally suited to anchoring shearwall ends is universally applicable.

### **Hurri-Bolt Uplift Solutions, Inc.**



**Wall Specifications:**

**Studs and Plates, SYP #2 Grade**

Studs: End Nailed with (2) 16d common  
Plates: Face Nailed with 12d common 6" o.c.  
Floor Truss: Face Nailed with 12d common 3" o.c.  
Wall Ends: (2) 2x4's

**Sheathing, 7/16" OSB one side**

Panel Edge: 4" o.c. nom., with 8d common  
Intermediate: 8" o.c. nom., with 8d common  
Joints: Blocked with 2x4

**Conventional Hardware: 'Slab':  
(per end)**

HD8A with 7/8" Grade 5 Bolt to Jig  
(3) 3/4" bolts Through End Wall Studs

**1<sup>st</sup> Floor:** (2) CS16 48" long with (28) 12d common  
Centered over floor section with (14) nails per end to studs

**2<sup>nd</sup> Floor:** (1) CS16 48" long with (28) 12d common  
Centered over floor section with (14) nails per end to studs

**Single Hurri-Bolt:  
(per End)**

**'Slab':** 1/2" Grade 5 Bolt to Jig, 2" Square Washer  
(HBSS) and Positive Stop Coupler (HBC)

**1<sup>st</sup>-2<sup>nd</sup> Floor:** 6' Hurri-Bolt Rods (HBR)

**Top Floor:** Hurri-Bolt Top Rod (HBT), SYP Top Plate Washer  
(HBST), and Nut (HBN)

**Double Hurri-Bolt:  
(per End)**

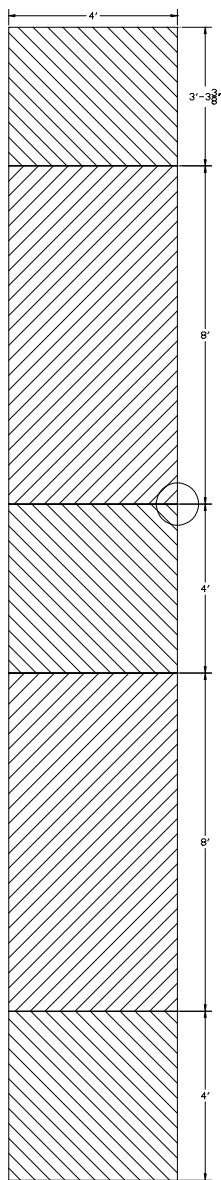
**'Slab':** (2) 1/2" Grade 5 Bolt to Jig, 2" Square Washer  
(HBSS) and Positive Stop Coupler (HBC)  
6" Apart

**1<sup>st</sup> Floor:** Hurri-Bolt Top Rod (HBT), SYP Top Plate Washer  
(HBST), and Nut (HBN) at 2<sup>nd</sup> Floor Sill Plate

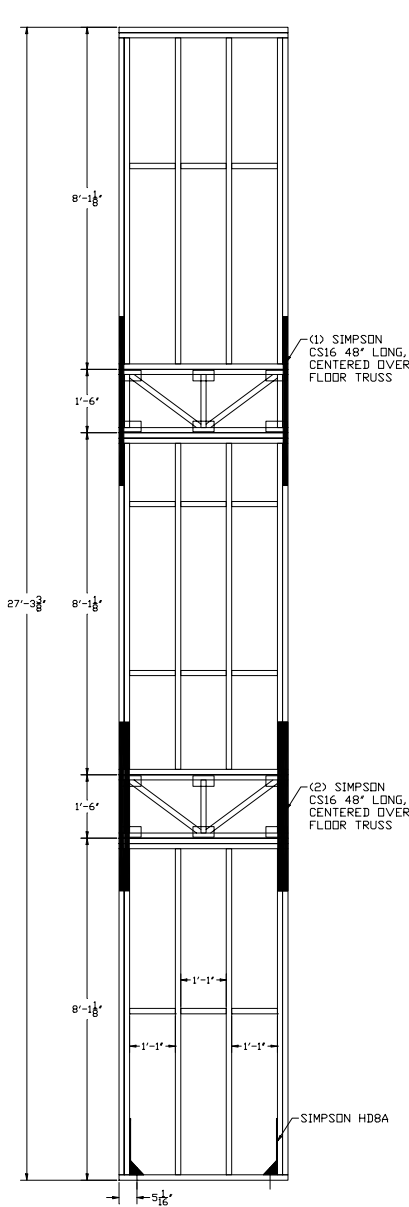
**2<sup>nd</sup> Floor:** 6' Hurri-Bolt Rods (HBR)

**Top Floor:** Hurri-Bolt Top Rod (HBT), SYP Top Plate Washer  
(HBST), and Nut (HBN)

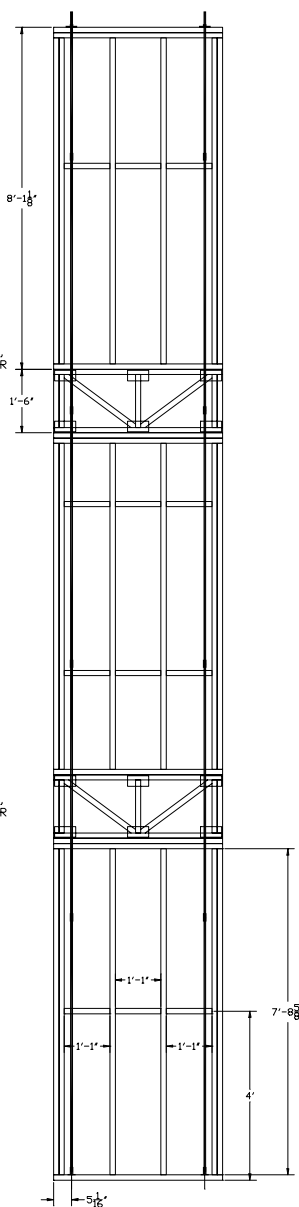
**Hurri-Bolt Uplift Solutions, Inc.**



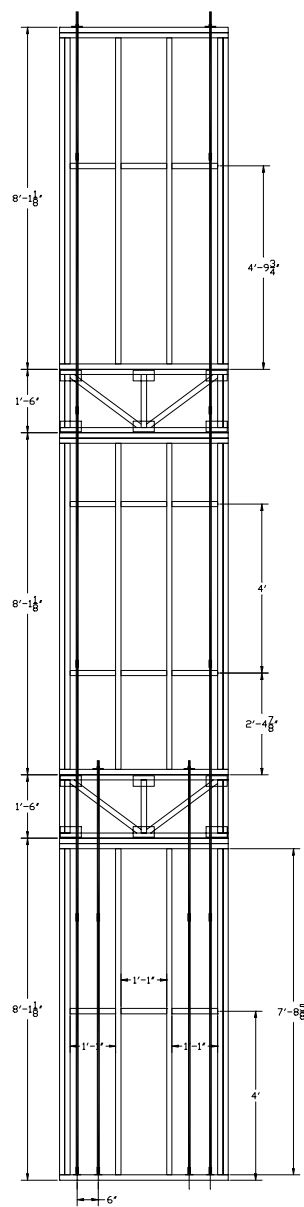
SHEATHING PATTERN



CONVENTIONAL STRAPS



(1) 1/2" Ø HURRI-BOLT ROD EACH END (3 STORY)



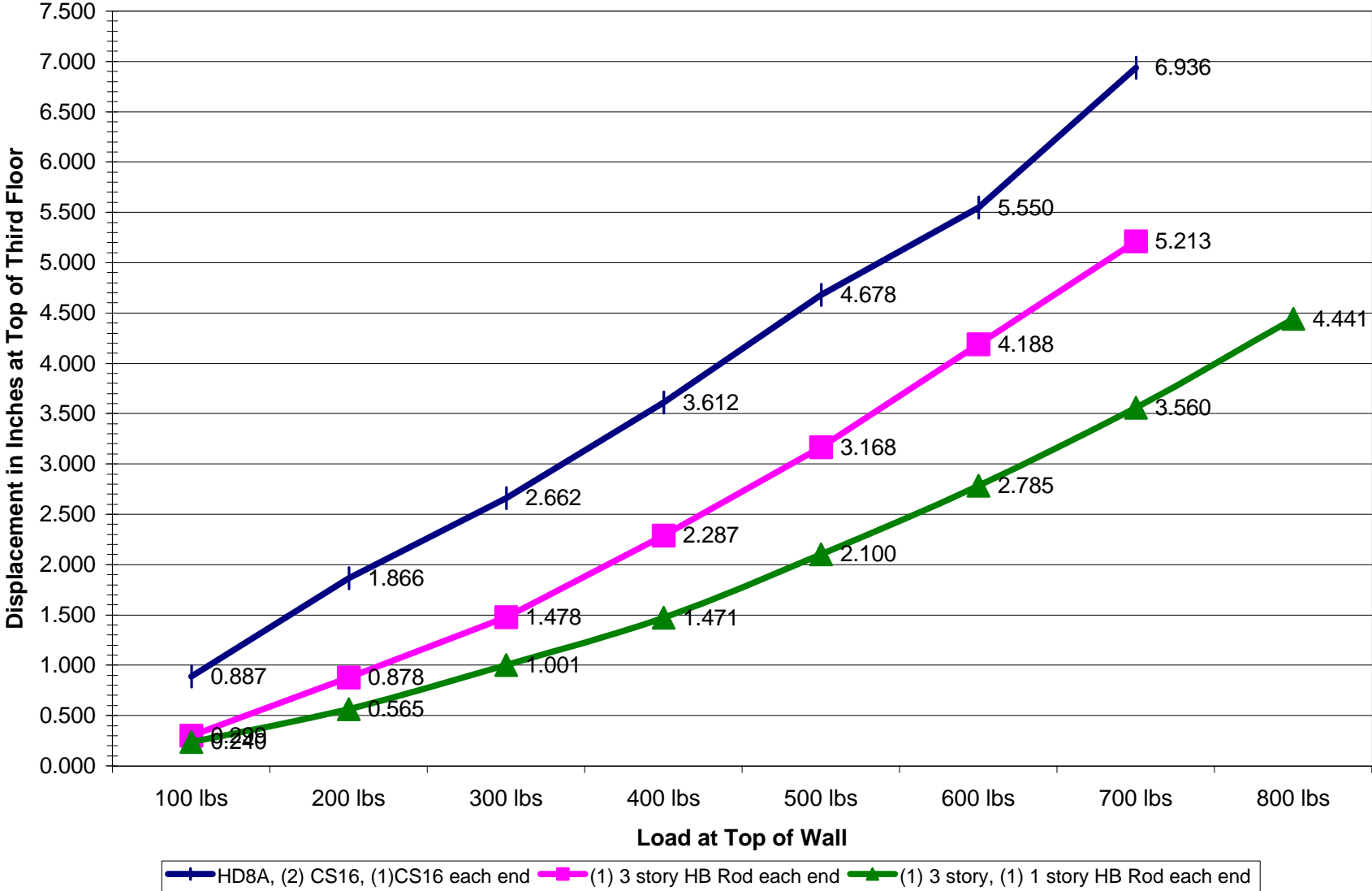
(1) 1/2" Ø HURRI-BOLT ROD EACH END (3 STORY),  
(1) 1/2" Ø HURRI-BOLT ROD EACH END (1 STORY)

## Wall Construction Detail Showing Sheathing Orientation, Wall Dimensions, and Hardware Configurations.

Hurri-Bolt Uplift Solutions, Inc.

2716 N. 46th Street • Tampa, FL 33605 • P.O. Box 5295 • Tampa, FL 33675 • Phone (813) 626 1676 • Fax (813) 626-8942 • Toll Free (800) 226-6888

# Displacement Vs. Load



## 3 Story Drift Test (Lateral Load vs. Displacement)

Trial	Holdown Type	Initial Reading	Lateral Load at Reading							
			100 lbs	200 lbs	300 lbs	400 lbs	500 lbs	600 lbs	700 lbs	800 lbs
1	HD8A, (2) CS16, (1)CS16 each	6.165	5.278	4.299	3.503	2.553	1.487	0.615	-0.771	Not Tested
		Displacement	0.887	1.866	2.662	3.612	4.678	5.550	6.936	

Trial	Holdown Type	Initial Reading	Lateral Load at Reading							
			100 lbs	200 lbs	300 lbs	400 lbs	500 lbs	600 lbs	700 lbs	800 lbs
2	(1) 3 story HB Rod each end	5.678	5.379	4.800	4.200	3.391	2.510	1.490	0.465	Not Tested
		Displacement	0.299	0.878	1.478	2.287	3.168	4.188	5.213	

Trial	Holdown Type	Initial Reading	Lateral Load at Reading							
			100 lbs	200 lbs	300 lbs	400 lbs	500 lbs	600 lbs	700 lbs	800 lbs
3	(1) 3 story, (1) 1 story HB Rod each end	4.745	4.505	4.180	3.744	3.274	2.645	1.960	1.185	0.304
		Displacement	0.240	0.565	1.001	1.471	2.100	2.785	3.560	4.441