

# EDGE SUPPORT CLIP TESTING

Prepared for

M&O Products, Inc.  
Portage, WI

Prepared by

NAHB Research Center  
400 Prince George's Blvd  
Upper Marlboro, MD 20774

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## PURPOSE AND BACKGROUND

M&O Products, Inc. produces a nylon alternative to steel clips used to provide edge support for wood structural panels. The Grip H Clips are made of high grade nylon to have comparable structural capabilities to traditional steel edge support clips. They also have some additional features to make installation easier.

The Research Center was contracted to verify comparable performance of the Grip H Clips with steel clips. The Voluntary Product Standard PS2 Performance Standard for Wood Based Structural Use Panels is the industry standard for defining the performance required of wood based structural panels. The PS2 standard does not contain performance requirements for edge support clips. It does provide procedures and criteria for testing structural panels with edge support. These procedures and criteria were used to guide this evaluation.

## PRODUCT DESCRIPTION

The Grip H Clip geometry is shown in photo #1. The tips of the clips are designed to grip the board. The clips measure 0.860 inches in width, 1.855 in length. The cross web thickness is 0.090 inches and the clip webs are 0.100 inches thick. Two versions of the clips were tested: one for use with 7/16" and 1/2" sheathing and one for use with 19/32" and 5/8" sheathing. Each clip is marked for the size boards it is made for. The only difference in the clip geometry is the opening for the sheathing. The opening dimension for the 7/16" and 1/2" clips was 0.510 inches. The opening dimension for the 19/32" and 5/8" clips was 0.645 inches. Both clip types are made of the same nylon material.



PHOTO 1

## SAMPLES AND SAMPLE PREPARATION

The client provided two bags of Grip H Clips (one for use with 7/16" and 1/2" sheathing and one for use with 19/32" and 5/8" sheathing) for this testing. The Research Center obtained comparable steel clips for 7/16" and 1/2" sheathing from two domestic manufacturers through common retail locations. The sheathing material for the testing was 7/16" 24/16 OSB, 1/2" 32/16 OSB and 19/32" OSB.

A sample set consisted of a 24" x 48" (64" for the 1/2" 32/16 and 96" for the 19/32" 40/20) piece of PS2 rated OSB to be loaded and a matching 16" wide piece as the support piece joined by a clip at the center of the span. Ten test panel/edge panels sample sets were cut from each thickness OSB tested.

Some plastic materials are susceptible to degradation from environmental factors specifically sunlight, heat, and cold. In an effort to evaluate any adverse effects from jobsite conditions the Grip H Clips were exposed to 200 hours of UV radiation prior to testing. Deterioration and brittleness due to UV exposure was one possible down side to nylon vs. steel. The steel clips were not irradiated.

In addition to the room temperature tests, a short series of tests were run to simulate the extremes of temperature the clips might be exposed to. Three tests were run, only on Grip H Clips, after freezing the samples (OSB and clips) at 0°F overnight. Three tests were run after baking samples at 200°F overnight.

## TEST METHOD

A Teco QL-2 machine was used in accordance with PS2-04 specifications to perform these tests. In an effort to minimize the effect any variation in the OSB panels had on the test results for the clips, each test panel/edge support set was tested for deflection with each type of clip for the 7/16" and 1/2" thicknesses.

Each sample set was tested for Concentrated Static Load (CSL) to a load of 200 lbf (per PS2) with each type of clip and the deflection was recorded. The clips were tested in a different order for each sample set to reduce systematic error. After the third 200 lbf loading, the load was increased to panel failure and the clip failure load and deflection as well as the maximum load for the panel were recorded.

The 19/32" sample set was only tested with the Grip H Clips. Each sample set was tested for CSL to a load of 200 lbf and the deflection was recorded. The panel was then loaded to failure. Clip failure deflection, load, and panel failure load were recorded. Two 19/32" panels were tested to failure with the 200 lbf deflection recorded as a control for these tests.

Three samples of Grip H Clips and the OSB panels were frozen overnight at 0°F and immediately tested to failure to determine if the clips became brittle when frozen. Although the clips and panels warmed up somewhat during testing, the time between removal from 0°F chamber to clip failure was kept to a minimum, estimated less than 3 minutes.

Three samples of Grip H Clips and the OSB panels were baked overnight at 200°F and immediately tested to failure to determine if the clips became weak when heated. Although the clips and panel cooled off somewhat during testing, the time between removal from 200°F chamber to clip failure was kept to a minimum, estimated less than three minutes.

## TEST RESULTS

### STANDARD TESTS (ROOM TEMPERATURE)

The table below reports the average deflection at the 200 lbf loading for each clip type.

Clip Type	Average Defl. @ 200 lbf (inches)					
	7/16" Samples 24" o.c.		1/2" Samples 32" o.c.		19/32 Samples 40" o.c.	
	Average	Std Dev	Average	Std Dev	Average	Std Dev
Grip H Clip	0.236	0.017	0.302	0.018	0.337	0.027
Steel #2	0.221	0.016	0.309	0.015		
Steel #1	0.238	0.020	0.300	0.021		
No Clip					0.492	0.006

The table below shows the average load at clip failure. Failure for the Grip H Clip typically was a brittle fracture. Failure for the steel clips was typically deformation and slippage off the panel edge.

Clip Type	7/16 24" o.c.		1/2 32" o.c.		19/32" 40" o.c.	
	Average Load (lbf) at clip failure	Std Dev	Average Load (lbf) at clip failure	Std Dev	Average Load (lbf) at clip failure	Std Dev
Grip H Clip	658	49	514	59	350	33
Steel #2	436	44	280	0		
Steel #1	478	110	322	39		

### TEMPERATURE EXTREME RESULTS

The results of the Grip H Clips and the cold and hot exposure tests with 7/16" panels are shown in the table below.

Sample	Deflection @ 200 Lbf	Deflection @ Failure	Load @ Clip Failure
Hot 1	0.272	0.65	460
Hot 2	0.257	0.60	480
Hot 3	0.257	0.65	490
Cold 1	0.241	0.75	660
Cold 2	0.230	0.70	680
Cold 3	0.243	0.80	700

### DISCUSSION OF RESULTS

The results for deflection at 200 lbf do not show any statistically significant difference between the performance of 7/16" - 1/2" Grip H Clips and the other clips tested.

Each panel set was flexed to 200 lbf three times, once for each clip type. There is no evidence that the 200 lbf loading weakened the sample panels for subsequent tests with the same panel set.

Taking the clips to failure did show some differences. The most obvious difference was the mode of failure. The steel clips deformed until they popped off the sample. The 7/16" - 1/2" nylon clips shattered into two or more pieces at failure. Also the steel clips all failed prior to the OSB panel failure, whereas the 7/16" - 1/2" nylon clips and the OSB panels often failed at the same time. The data shows that that the 7/16" - 1/2" nylon clips supported the sample to an approximately 50 percent higher load than the steel clips before clip failure.

Because the similarity in design and materials and the acceptable performance demonstrated by the 7/16" - 1/2" clips the full test sequence was not repeated on both 19/32" and 5/8" sheathing. The 19/32" thickness was chosen as the likely worst case for the clip. The 19/32" - 5/8" nylon clips reduced the deflection of the OSB such that the 200 lbf deflection was well below the 0.5" maximum specified in PS2, compared to the deflection without support right at the 0.5" maximum. The 19/32" - 5/8" clips failed at a much lower load than the 7/16" - 1/2" clips. This is due to clip failure occurring based on deflection, not a specific load and the tests on a 40" span had a lower load when the clip failed.

The temperature extreme tests did show an approximate 30 percent degradation of performance for the hot samples in terms of the clip failure load. The 200 lbf deflection values for the hot samples were consistent with the other test results. The cold samples performance, both 200 lbf deflection and failure load, was consistent with the other test results.

### CONCLUSIONS

The performance of the Grip H Clips on 7/16", 1/2" and 19/32" panels exceed the PS2 requirements for all tests. There was no statistical difference in the performance of the 7/16" - 1/2" Grip H Clips and the two brands of steel clips tested except that the Grip H Clip supported a greater maximum load before clip failure on the 7/16" and 1/2" samples.

**DISCLAIMER**

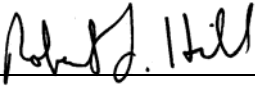
The test results are based on the samples provided as described above. The NAHB Research Center does not make any representation that the samples provided are indicative of typical or ongoing product production.



Eric Lieser  
Project Leader

August 14, 2007

Date



Robert L. Hill, Director  
Laboratory Sciences & Certification Programs

August 14, 2007

Date

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**APPENDIX A**

**TEST DATA**

7/16" 24/16 OSB on 24" Centers

Panel Set #	Clip Type	Defl. @ 200 lbs.	Clip Type	Defl. @ 200 lbs.	Clip Type	Defl. @ 200 lbs.	At Clip Failure		Max Load
							Load	Defl.	
	1st Flexure		2nd Flexure		3rd Flexure				
1	Steel #1	0.271	Steel #2	0.242	GripH	0.257	602	0.8	602
2	Steel #1	0.235	GripH	0.230	Steel #2	0.217	420	0.4	588
3	Steel #2	0.221	Steel #1	0.231	GripH	0.227	667	0.8	677
4	GripH	0.220	Steel #1	0.213	Steel #2	0.205	500	0.5	642
5	Steel #2	0.229	GripH	0.247	Steel #1	0.252	555	0.8	555
6	GripH	0.261	Steel #1	0.265	Steel #2	0.246	400	0.4	514
7	Steel #1	0.232	Steel #2	0.213	GripH				
8	GripH	0.232	Steel #2	0.209	Steel #1	0.221	400	0.4	543
9	Steel #2	0.201	Steel #1	0.217	GripH	0.210	695	0.8	695
10	Steel #1	0.238	GripH	0.237	Steel #2	0.216	425	0.4	605

Note: The data for the Grip H Clip on Sample 7 has been omitted from this analysis because of a problem with the test procedure.

1/2" 32/16 OSB on 32" Centers

Panel Set #	Clip Type	Defl. @ 200 lbs.	Clip Type	Defl. @ 200 lbs.	Clip Type	Defl. @ 200 lbs.	At Clip Failure		Max Load
							Load	Defl.	
	1st Flexure		2nd Flexure		3rd Flexure				
1	Steel #2	0.294	GripH	0.291	Steel #1	0.257	360	0.4	614
2	Steel #1	0.291	Steel #2	0.300	GripH	0.299	575	0.8	666
3	GripH	0.306	Steel #2	0.311	Steel #1	0.311	340	0.5	658
4	Steel #2	0.292	GripH	0.276	Steel #1	0.280	530	0.4	550
5	GripH	0.281	Steel #1	0.297	Steel #2	0.293	280	0.4	531
6	Steel #2	0.317	GripH	0.303	Steel #1	0.306	280	0.4	617
7	Steel #1	0.301	Steel #2	0.318	GripH	0.302	550	0.8	561
8	Steel #2	0.333	Steel #1	0.321	GripH	0.318	450	0.7	608
9	Steel #2	0.327	Steel #1	0.328	GripH	0.339	480	0.8	580
10	GripH	0.301	Steel #2	0.307	Steel #1	0.310	280	0.5	609

19/32" 40/20 OSB on 40" Centers

Panel Set #	Clip Type	Defl. @ 200 lbs.	At Clip Failure		Max Load
			Load	Defl.	
	1st Flexure				
1	GripH	0.331	380	0.6	935
2	GripH	0.355	350	0.6	759
3	GripH	0.336	360	0.6	873
4	GripH	0.338	350	0.6	694
5	GripH	0.315	370	0.6	889
6	GripH	0.352	310	0.5	731
7	GripH	0.394	300	0.6	754
8	GripH	0.330	330	0.6	651
9	GripH	0.292	410	0.6	738
10	GripH	0.329	340	0.6	811
11	None	0.496	-	-	682
12	None	0.487	-	-	786