

Third Party Load Testing AceClamp Products

Linear Testing per T-0101 Rev (A)

(Parallel to the Roof Panel Seam)

Clamp Tested	Panel Type	Panel Material	Panel Thickness	Torque in-lbs.	Max. Linear Resistance Lbs	Safety Factor = 2	Panel Failure
ML	Firestone UC6 & UC3	Steel	22ga	175	1382	691	N
ML	Firestone UC6 & UC3	Steel	24ga	175	1363	682	N
ML	Firestone UC6 & UC3	Al	32ga	135	1666	833	Y*
ML	IMETCO Series 300	Steel	22ga	175	1060	530	N
ML	IMETCO Series 300	Steel	24ga	175	1350	675	N
ML	Englert A1000	Steel	24ga	175	685	343	N
A2	Arch Sheet metal Prod ML-100	Steel	24ga	195	937	469	N
A2	Arch Sheet metal Prod ML-150	Steel	24ga	240	857	429	N
A2	Arch Sheet metal Prod SL-150	Steel	24ga	195	736	368	N
A2-N	Arch Sheet metal Prod SL-175	Steel	24ga	175	800	400	N
A2	Englert A1000	Steel	24ga	195	958	479	N
A2	Havelock Legacy Single-Lock	Steel	26ga	195	937	469	N
A2-N	Havelock Legacy Snap Lock	Steel	26ga	195	847	424	N
A2-N	Merchant Evans Classic Rib 305	Al	0.04 in	165	949	475	N
A2	Merchant Evans Traditional Rib 306	Al	0.04 in	165	590	295	N
A2	MORIN SLR	Steel	24ga	195	1320	660	N
A2-N	Wayne Building Prod 1" Snap Seam	Steel	24ga	165	847	424	N
A2-Nw	Classic 1.0" WeatherLock Plus	Steel	24ga	160	578	289	N
A2-Nw	Westform Snap-Lock	Steel	24ga	175	698	349	N
A2-Nw	Westform Snap-Lock	Steel	26ga	175	627	314	N
A2-Nw	Westform Prolock	Steel	24ga	120	827	413	N

Vertical Testing per T-0101 Rev (A)

(Perpendicular to the Roof Panel Seam)

Clamp Tested	Panel Type	Panel Material	Panel Thickness	Torque in-lbs.	Max Load - Lbs.	Safety Factor = 2	Panel Failure
ML	Single-Lock	Steel	22ga	175	998	499	N
ML	Single-Lock	Steel	24ga	175	924	462	N
ML	Dbbl-Lock	Al	0.032 in.	135	1138	569	N
ML	Dbbl-Lock	Al	0.04 in.	135	974	487	N
ML	Snap-Lock	Steel	24ga	175	685	343	N
ML	Garland R-Mer Span	Steel	22ga	175	1198	599	N
ML	IMETCO Series 300	Steel	22ga	175	998	499	N
ML	Morin-Zip	Al	0.04 in.	135	1744	872	N
ML	Morin-Zip	AL	0.04 in.	135	1843	922	Y*
ML	Merchant Evans Zip-Rib	Galvalume	22ga	175	1503	752	N
ML	Merchant Evans Zip-Rib	Al	0.032 in.	135	1042	521	N
ML	Merchant Evans Zip-Rib	Al	0.04 in.	135	1023	512	N
ML	Merchant Evans Zip-Rib	Al	0.05 in.	150	1080	540	N
A2-N	Berridge Cee Lock	Steel	24ga	195	1200	600	N
A2	Butler MR-24	Steel	24ga	195	801	401	N
A2	Butler MR-24	Steel	24ga	195	1571	786	N
A2	Butler MR-24	Steel	24ga	225	1645	823	N

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Vertical Testing per T-0101 Rev (A) Continued

(Perpendicular to the Roof Panel Seam)

Clamp Tested	Panel Type	Panel Material	Panel Thickness	Torque in-lbs.	Max Load - Lbs.	Safety Factor = 2	Panel Failure
A2	Havelock Legacy Single-Lock	Steel	26ga	195	1006	503	N
A2-N	Havelock Legacy Snap Lock	Steel	26ga	195	980	490	N
A2 Mini	Merchant Evans Zip-Lok	Zinc	0.8 mm	165	1476	738	N
A2	Merchant Evans Zip-Lok	Steel	24ga	195	752	376	N
A2	MORIN SWL	Steel	24ga	195	958	479	N
A2	MORIN SLR	Steel	24ga	195	1376	688	N
A2-N	Wayne Building Prod 1" Snap Seam	Steel	24ga	165	758	379	N
A2-Brass	Taylor 12" Easy Lock	Copper	16oz CU	125	400	200	Y*
A2-Nw	Classic 1.0" WeatherLock Plus	Steel	24ga	160	698	349	N
A2-Nw	Westform Snap-Lock	Steel	24ga	175	815	408	N
A2-Nw	Westform Snap-Lock	Steel	26ga	175	735	368	N
A2-Nw	Westform Prolock	Steel	24ga	120	833	417	*

* Screws securing panel to plywood pulled out during test. AceClamp still attached to the seam. Test data 12/11/18.

Linear Testing per T-0101 Rev (A) - Snow Rails

(Tested brackets and clamps on two parallel SSMR ribs)

Clamp Assembly	Panel Type	Panel Material	Panel Thickness	Torque in-lbs.	Max Load -	Panel Failure	Comments
SP1D	Butler MR-24	Steel	24ga	195	2644	N	
SP1	Butler MR-24	Steel	24ga	195	1227	N	
SP1D	MORIN SCR	Steel	24ga	195	2946	N	SS Screw required at ridge
SP1D	Merchant Evans 305	Steel	24ga	195	2487	N	
Z2-2	Merchant Evans 305	Steel	24ga	175	2174	N	

The purpose of this test is to determine "force-to-lift" rail at increasing bolt torque specs.

Test Sample: AceClamp serrated washer	Torque - in. lbs.	Load - lb.	Failure
The assumption is that wind uplift loads can lift a PV panel off the bottom spacer or off the rail. We tested to find the load required to lift the panel at varying torque loads. Engineering data can relate the vertical load to the wind uplift loading based on the ASCE 7-10 or local code wind tables.	10	142	No
	20	160	No
	30	330	No
	40	490	No
	50	550	No
	60	590	No

*AL and CU panel failures due to seam separation or panel pulling over screws fastening to plywood deck. AceClamps still intact.