Roof Sheet Testing Kit

TRAINING MANUAL & CHECKLIST

Collaboration Partner

Gamcorp

Contents

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For more Information
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CLENERGY ENGINEERING

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Monday, 11 September 2023

Product Purpose Summary

1.1. The purpose of the Klip-lok roof testing kit and this document is to determine the uplift capacities of the roof with the Clenergy interface correctly. This is required in case the exact roof type cannot be identified, or the roof type is identified but Clenergy does not have NATA lab test results available for it.

Roof Testing Considerations

1.2. Weather conditions and time:
1.2.1. Ensure that there is minimal/no rain on the testing day for the safety of the workers on the roof. If the surface is wet, please dry before testing. Be mindful of extreme heat as workers will spend most of their working day in an elevated area with minimal sun protection.
1.3. Select the best-fitting Roof Clamp type, using the Klip-lok keyring included with the kit.
1.4. Availability of elevating work platform (EWP) and access to the Roof:
1.4.1. Ensure an on-site plan at the EWP location and sufficient access to lift necessary equipment onto the roof area. From the cases we have tested, we have found that the 'cherry picker' is the most suitable for this type of elevation.
1.5. Working at heights training certificates:
1.5.1. Ensure that the people performing the roof test have a firm understanding of the risks involved with performing works of this nature and that they have the correct certification and / or received required working at heights training.
1.6. Ensure that a safe work method statement is completed prior accessing the roof.
1.7. Watch the KL testing video (https://www.youtube.com/watch?v=b9aBUc5oeto)
1.8. Avoid stepping on ribs, instead position your foot in the valley of the roof profile

1.9. Testing Points:
1.9.1. Spread out the testing points evenly on the roof. There are always 2 to 4 types of load points to test:

Full Rib on purlin (A)
Lap joint on purlin (B)
Full Rib halfway between purlins (C) [Only for Off-purlin installation assessment via Clenergy]
Lap joint halfway between purlins (D) [Only for Off-purlin installation assessment via Clenergy]

1.9.2. Each of these 4 points require several repetitions depending on the system size. <u>Each repetition should be conducted at a different location on the roof. Do not place clamps on the last purlin or within 1m from the end of the roofing sheet.</u>

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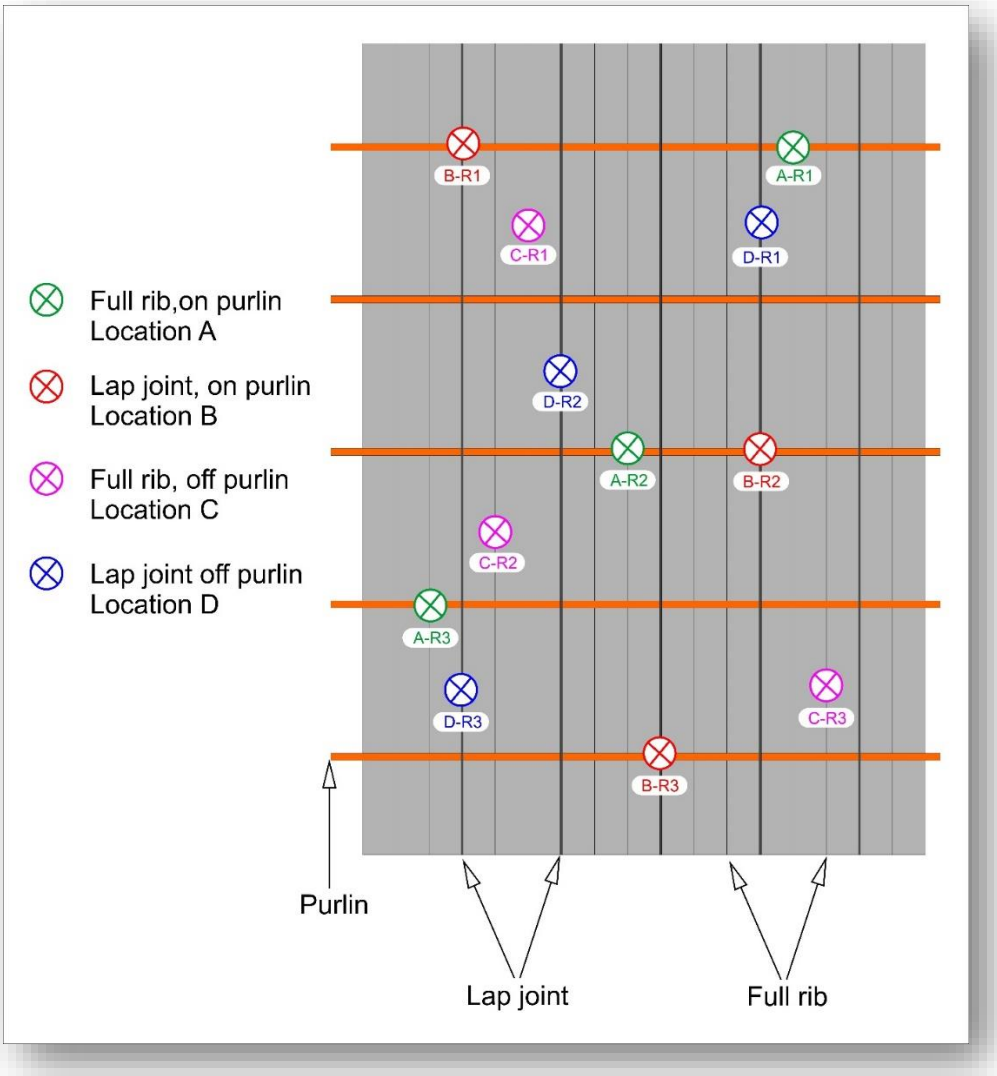
1.9.3. We recommend the following minimum number of repetitions depending on the system size:

System Size	Repetitions
Up to 100kW	3 repetitions
100-500kW	5 repetitions
Over 500kW	10 repetitions

1.9.4. If you test multiple roofing sheet types on the same roof or multiple buildings on the same project, the same number of repetitions listed above would apply for each.

1.9.5.For safety reasons we recommend at least a team of two to perform the testing.



In the test report, provide a satellite image marking the locations on the roof where you tested. You can mark these as A-R1, B-R1, C-R1, D-R1, A-R2, B-R2… and so on

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Tools and Materials Checklist

- ❑ All relevant PPE required:
  - ❑ Hi-vis Top
  - ❑ Safety Boots
  - ❑ Safety Harness (if required)
- ❑ Camera / Phone camera
- ❑ Measuring tape
- ❑ Roof sheeting testing checklist and pen
- ❑ Clenergy Roof testing Kit
- ❑ Clenergy Kliplok clamps
- ❑ Torque Wrench❑ Sun protection (suncream, hat if required)

Roof Sheet Testing Procedure:

Note: The following steps shall be followed for safe roof sheet testing and to obtain the best results. These steps are to be performed by at least two members to ensure the safety and accuracy of results.

1.10. Complete the checklist provided on the previous page to ensure the equipment is ready to go the day before the Roof Sheet Testing.

1.11. Ensure you are wearing all appropriate PPE Equipment.

1.12. Once you are on-site, put on the safety harness if required. If you are using EWP, start setting up the EWP in the desired location.

1.13. Place the traffic safety cones around the EWP.

1.14. One worker shall get onto the roof using the EWP or other applicable access method. The worker must then check the following:

1.14.1. Determine the best location to place the tools and equipment, preferably to be placed on top of the purlins.

Note: To locate the purlin from top of the roof, apply pressure with your foot on the visible purlin location and wait for the area with the highest resistance. It is sufficient to estimate the purlin location.

1.14.2. Monitor (Observe) the other worker while getting up to the roof.

1.14.3. Ensure everything required for the Roof Sheet Testing is on the roof.

1.14.4 Both workers shall work together to get all the tools and materials onto the roof.

1.14.5 Avoid lifting and handling of the materials within 2m from the roof edge for safety purposes.

1.15. Measure roof sheeting and purlin spacing details as per Appendix B Clenergy Checklist and Results Table and note them down.

1.16. Mark the location of testings as per section 2.5 (Roof Testing Considerations – testing points)

1.17. Set up the roof testing kit on the first point, fix the winch, and attach the force gauge to the system to read the measurements.

1.18. Its best to place 4 pieces of thin timber or carpet pieces under the sawhorse legs to avoid scratches to the roof.

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1.19. Whenever possible avoid positioning the legs of the sawhorse on the same roofing sheet that is being tested. Furthermore avoid standing on the roofing sheet within 1m of the clamp while performing the testing.

1.20. Fix the roof clamp to the first testing point, tighten the side bolts using the wrench according to the table below, and connect the clamp to the system using the hook.

Clamp	Tighten force
ER-I-09/32/29	16-20 N.m
ER-I-34	9-11 N.m

1.21. Ensure that the roof sheet in a test is not supporting the testing kit, the workers' legs, and other materials.

1.22. Once you are confident that the system is set up correctly, the roof is stable, and your legs are placed firmly onto it without causing any damage, begin winding the winch using the handle slowly and carefully.

1.23. These are the events when you need to stop pulling.

1.23.1. Do not pull higher than 2.5kN.

1.23.2. Excessive roof deflection

1.23.3.

1.24. Please avoid conversation, music or any other acoustic disturbance while pulling on the clamp to ensure that you hear clearly if the roofing sheet buckles or if the roofing sheet achieves its maximum pulling capacity.

1.25. Record the gauge reading:

The objective is to find the maximum force before any failure mode takes place without causing damage to the roof.

Do not pull any further once you have achieved 3kN. Most results will be less than this value. Stop the test before reaching excessive deflection. Note: Refer to Appendix A Possible Failure Modes.

1.26. Video record steps 1.22 and 1.24

1.27. Repeat steps 1.17- 1.25 for the rest of the locations.

Note: Take enough photos of each step for our records and QA check.

1.28. Finishing up the job:

1.28.1. Pack up all the tools and materials and place them in the EWP. Safely alight from the roof.

1.28.2. Remove the safety cones and park the EWP in the designated parking area.

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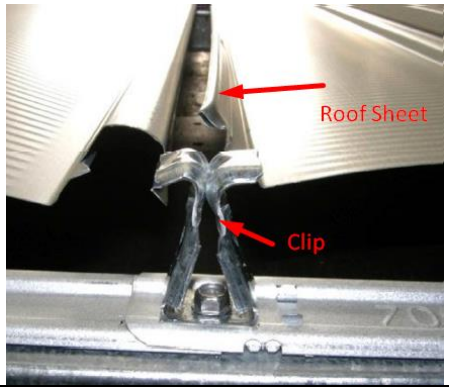
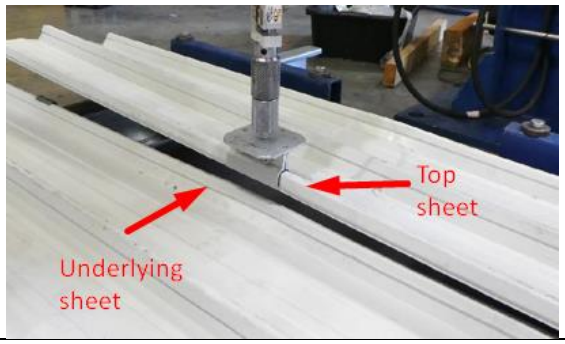
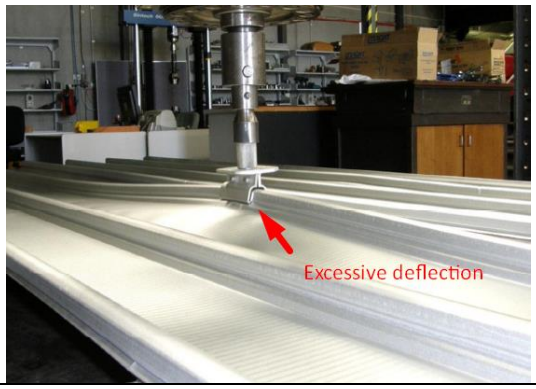
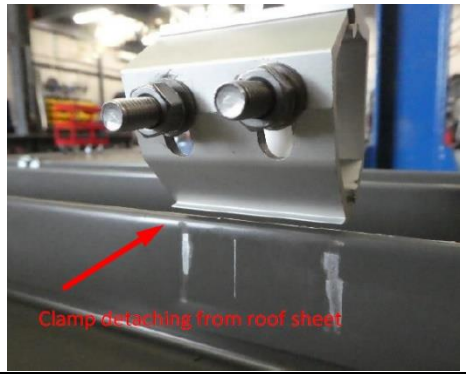
Appendix A. Possible Failure Modes

Possible failure modes	
Roof sheet detached from concealed clips	
Top sheet pulled up from underlying sheet at lap-joint point	
Excessive roof sheet deflection	
Interface clamp pulled away from full rib	

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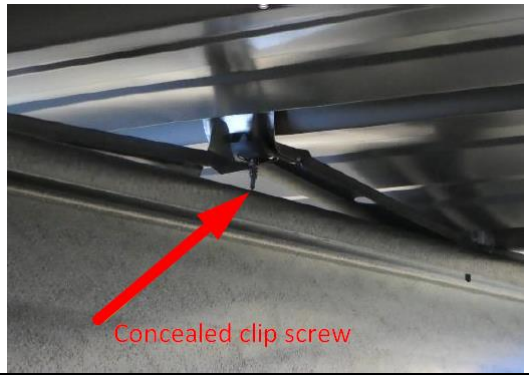
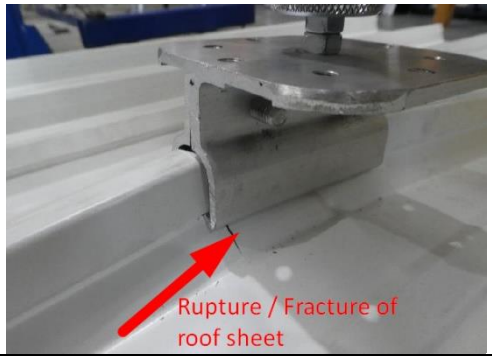
Concealed clip screw detached from concealed clip	
Rupture/fracture of underlying sheet at clamp interface	

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Appendix B. Clenergy ez-Checklist – Fill in, sign, and send it to engineering@clenergy.com.au

ez-Checklist Roof Testing Kit		
PROJECT DETAILS:		
Project Name & Location *Full Address:*		
Terrain Category *TC 1, 1.5, 2, 2.5, 3, 4:*		
Wind Region *A, B, C or D:*		
Project Size *kW:*		
BUILDING INFORMATION:		
Building Use *such as residential, hospital, education etc:*		
Building Dimensions:	*Length x Width (m):*	
	Height (m):	
Roof Pitch:		
Purlin Spacing:		
Parapet Height:	*Maximum (m)*	
	Minimum (m)	
PV MODULE INFORMATION:		
Panel Dimensions *Length x Width x Thickness (mm)*:* **for frameless panels, contact tech@clenergy.com.au for further advise*		
Panel Weight *kg:*		
Panel Power *Wp:*		
Panel Layout: *Please attach layout in PDF of aerial picture*		
Roof Testing Details		
Number of test locations		*Defined by Clenergy*
Selected non-pen clamp: ER-I-09/32/29/34		
Name of the person preforming the testing		
CEC Accreditation Number		
Date and Time of the test		
Signature		

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Appendix C. Results Table

General Location	Repetition	Location code	Recorded Uplift Force (kN)	Comments/Failure point
Location A Full Rib On Purlin	1	A-R1		
	2	A-R2		
	3	A-R3		
	4	A-R4		
	5	A-R5		
	6	A-R6		
	7	A-R7		
	8	A-R8		
	9	A-R9		
	10	A-R10		
Location B Lap Joint On Purlin	1	B-R1		
	2	B-R2		
	3	B-R3		
	4	B-R4		
	5	B-R5		
	6	B-R6		
	7	B-R7		
	8	B-R8		
	9	B-R9		
	10	B-R10		

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General Location	Repetition	Location code	Recorded Uplift Force (kN)	Comments/Failure point
Location C Full Rib On Purlin	1	C-R1		
	2	C-R2		
	3	C-R3		
	4	C-R4		
	5	C-R5		
	6	C-R6		
	7	C-R7		
	8	C-R8		
	9	C-R9		
	10	C-R10		
Location D Lap Joint On Purlin	1	D-R1		
	2	D-R2		
	3	D-R3		
	4	D-R4		
	5	D-R5		
	6	D-R6		
	7	D-R7		
	8	D-R8		
	9	D-R9		
	10	D-R10		