

Mechanical Testing

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IN CONFIDENCE TO THE CLIENT

REPORT No: 20-0948

UPLIFT LOAD TESTING OF SOLAR MOUNTING CLAMPS

CLIENT: **XIAMEN GOOMAX ENERGY TECHNOLOGY CO. LTD**
 ATTENTION: CINDY WU
 GOOMAX INDUSTRIAL PARK
 DONGTIAN TOWN, NAN'AN CITY, CHINA

DATE OF TEST: OCTOBER 12TH – OCTOBER 15TH 2020

DATE OF REPORT: OCTOBER 15TH 2020

TEST SYNOPSIS:

A consignment of roof sheeting, concealed fixing clips and solar mounting clamps were delivered by the client to the MTS laboratory for uplift load testing (see Fig.1). Each item was to be load tested as per the specific test instructions provided by the client, with five (5) repeat tests conducted for each supplied configuration.

Upon arrival at the laboratory and prior to testing, each configuration was inspected and in conjunction with the client the following identification details were recorded:



FIG.1
TEST ITEMS

Goomax Solar Clamp Identification:

- GM-MRH-07-AZ: *Lysaght Kliplok 700 Large Clamp*
- GM-MRH-19-AZ: *Lysaght Kliplok 406 and 700 Small Clamp*
- GM-MRH-06-AZ: *Lysaght Kliplok 406 Small Clamp*
- GM-MRH-20-AZ: *Lysaght Kliplok 406 and 700 Large Clamp*
- GM-MRH-18-AZ: *Lysaght Longline 305 Clamp*
- GM-MRH-T4-AZ: *Lysaght Trimdek Clamp*

Roof Sheetting Identification:

- Lysaght Kliplok 700, incorporating concealed fixing clip*
- Lysaght Kliplok 406, incorporating concealed fixing clip*
- Lysaght Longline 305, incorporating concealed fixing clip*
- Lysaght Trimdek, incorporating concealed fixing clip*

TEST PROCEDURE:

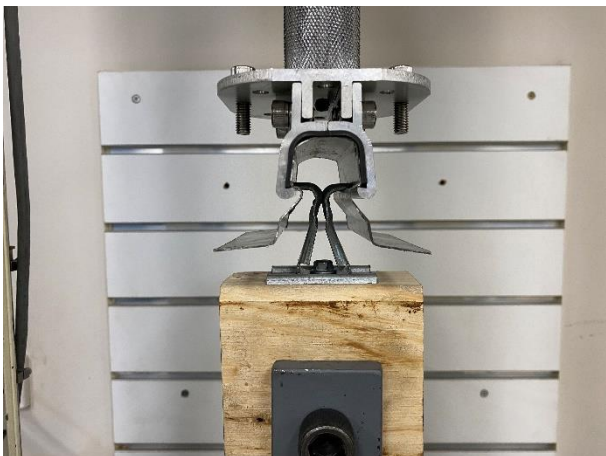
Test clamps, concealed fixing clips and roof sheeting were prepared by MTS prior to testing. At the request of the client, the pre-assembled units were to be tested following CLEAN ENERGY COUNCIL, NON-PENETRATING CLAMP PROOF LOAD TESTING BEST PRACTISE REQUIREMENTS (REV 1.0) (see Fig.2). The Goomax solar clamps were clamped to the rib of the roof sheeting, targeting a tightening torque of 18Nm. As requested by the client, an uplift force was applied to the roof sheet/Goomax solar clamp assembly until a maximum uplift test force was achieved. At this point, the main mode of failure and corresponding test load was recorded (see Figs. 3, 4 and 5).



**FIG.2
TEST SET-UP**



**FIG.3
CONCEALED CLIP SCREW DEFORMATION**



**FIG.4
UPLIFT OF KLIPLOK 700 CONCEALED CLIPS**



**FIG.5
TRIMDEK ROOF SHEET DEFORMATION**

TEST OBSERVATIONS AND TEST DATA:

Test observations and test data can be seen in Table 1.
Load vs Displacement test graphs are provided in Figs. 6 – 11.

Goomax Clamp I.D.	Tested Roof Sheet	Maximum Uplift Force (kN)	Test Observations
GM-MRH-07-AZ	Lysaght Kliplok 700	2.9	Uplift deformation of concealed fixing clip
GM-MRH-07-AZ	Lysaght Kliplok 700	2.6	
GM-MRH-07-AZ	Lysaght Kliplok 700	2.8	
GM-MRH-07-AZ	Lysaght Kliplok 700	2.7	
GM-MRH-07-AZ	Lysaght Kliplok 700	2.9	
GM-MRH-19-AZ	Lysaght Kliplok 700	2.4	Uplift deformation of concealed fixing clip
GM-MRH-19-AZ	Lysaght Kliplok 700	2.4	
GM-MRH-19-AZ	Lysaght Kliplok 700	2.3	
GM-MRH-19-AZ	Lysaght Kliplok 700	2.5	
GM-MRH-19-AZ	Lysaght Kliplok 700	2.5	
GM-MRH-06-AZ	Lysaght Kliplok 406	2.8	Deformation of kliplok fixing clip coinciding with timber fixing screw
GM-MRH-06-AZ	Lysaght Kliplok 406	2.6	
GM-MRH-06-AZ	Lysaght Kliplok 406	2.4	
GM-MRH-06-AZ	Lysaght Kliplok 406	2.7	
GM-MRH-06-AZ	Lysaght Kliplok 406	2.4	
GM-MRH-20-AZ	Lysaght Kliplok 406	2.7	Deformation of kliplok fixing clip coinciding with timber fixing screw
GM-MRH-20-AZ	Lysaght Kliplok 406	2.5	
GM-MRH-20-AZ	Lysaght Kliplok 406	2.5	
GM-MRH-20-AZ	Lysaght Kliplok 406	2.8	
GM-MRH-20-AZ	Lysaght Kliplok 406	2.7	
GM-MRH-18-AZ	Lysaght Longline 305	1.6	Uplift slip of Goomax Solar clamp from roof sheeting
GM-MRH-18-AZ	Lysaght Longline 305	1.9	
GM-MRH-18-AZ	Lysaght Longline 305	1.8	
GM-MRH-18-AZ	Lysaght Longline 305	1.8	
GM-MRH-18-AZ	Lysaght Longline 305	2.1	
GM-MRH-T4-AZ	Lysaght Topdek	1.2	Buckling deformation of Trimdek roofing sheet
GM-MRH-T4-AZ	Lysaght Topdek	1.1	
GM-MRH-T4-AZ	Lysaght Topdek	1.2	
GM-MRH-T4-AZ	Lysaght Topdek	0.9	
GM-MRH-T4-AZ	Lysaght Topdek	0.9	

**TABLE 1
TEST DATA**

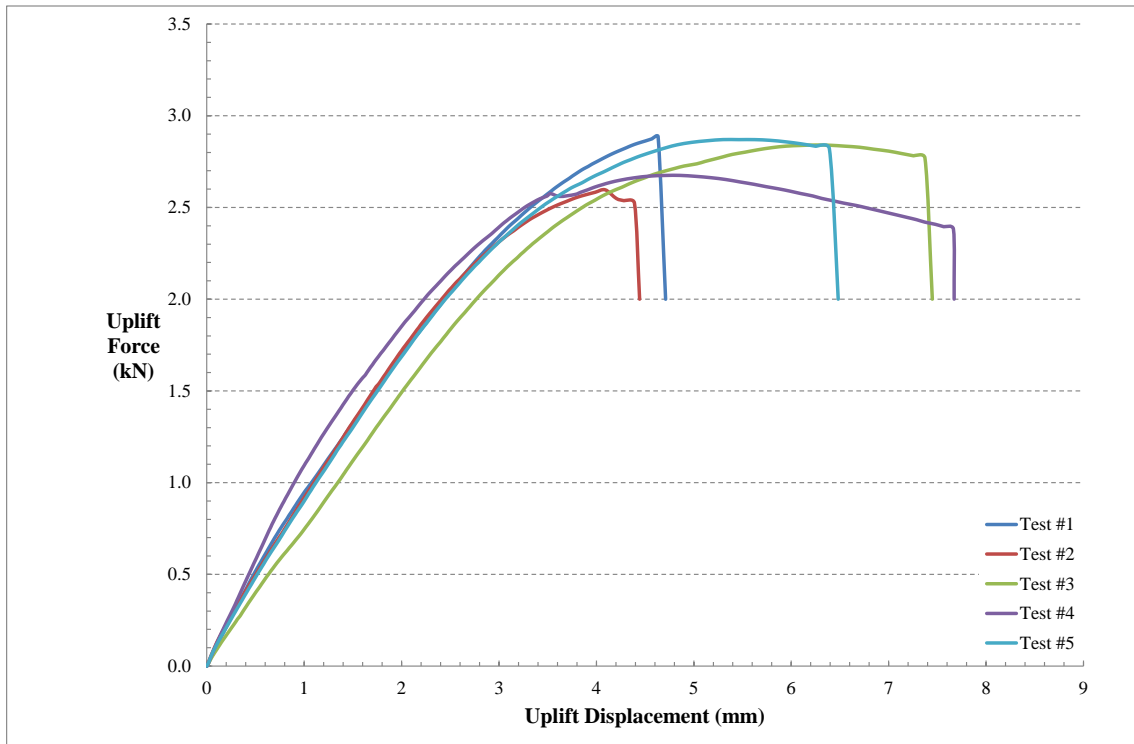


FIG.6
GM-MRH-07-AZ, KLIPLOK 700
LOAD VS DISPLACEMENT GRAPH

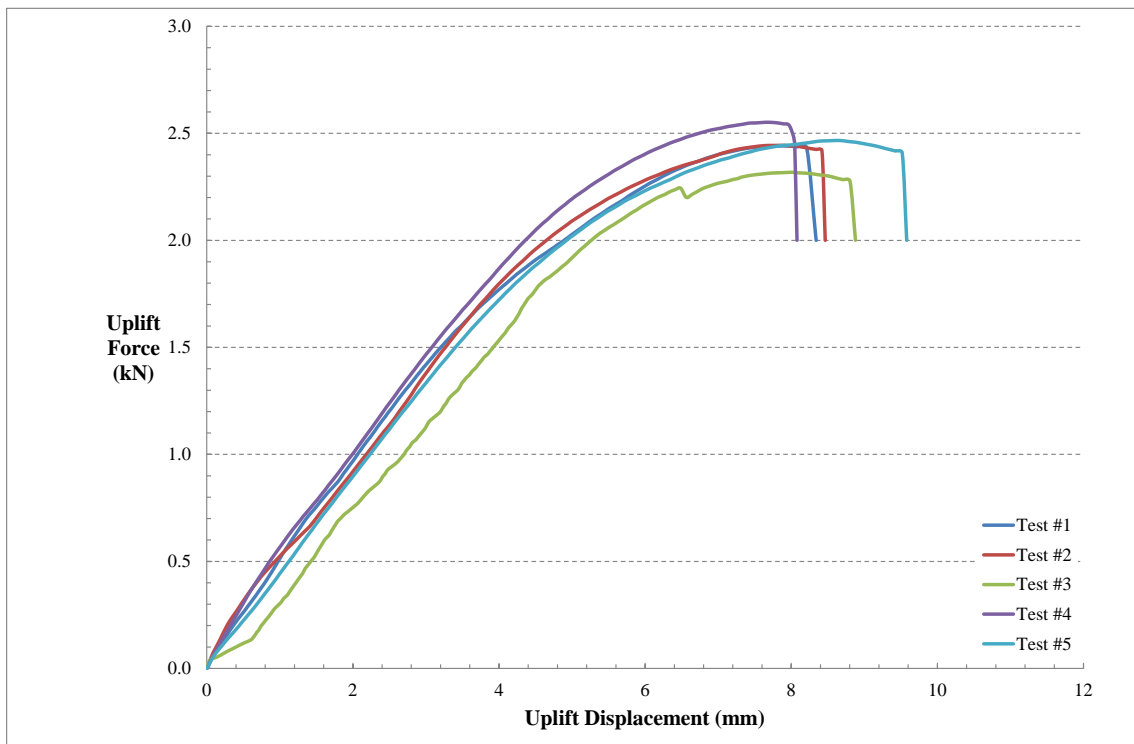


FIG.7
GM-MRH-19-AZ, KLIPLOK 700
LOAD VS DISPLACEMENT GRAPH

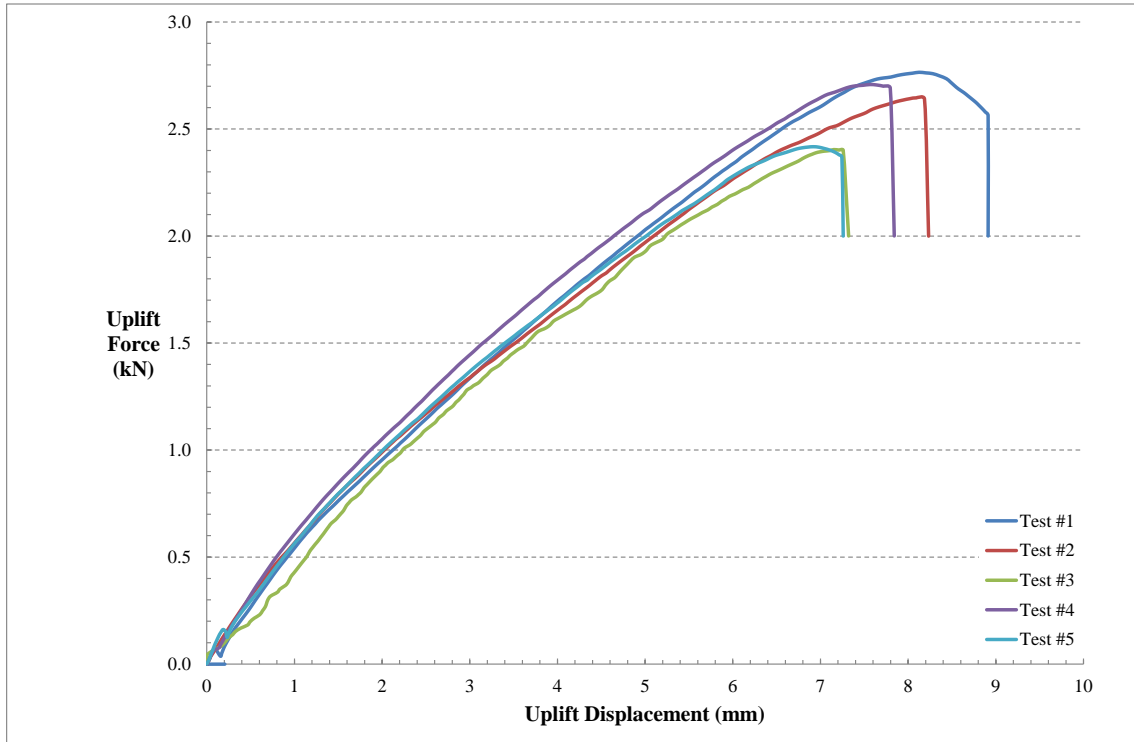


FIG.8
GM-MRH-06-AZ, KLIPLOK 406
LOAD VS DISPLACEMENT GRAPH

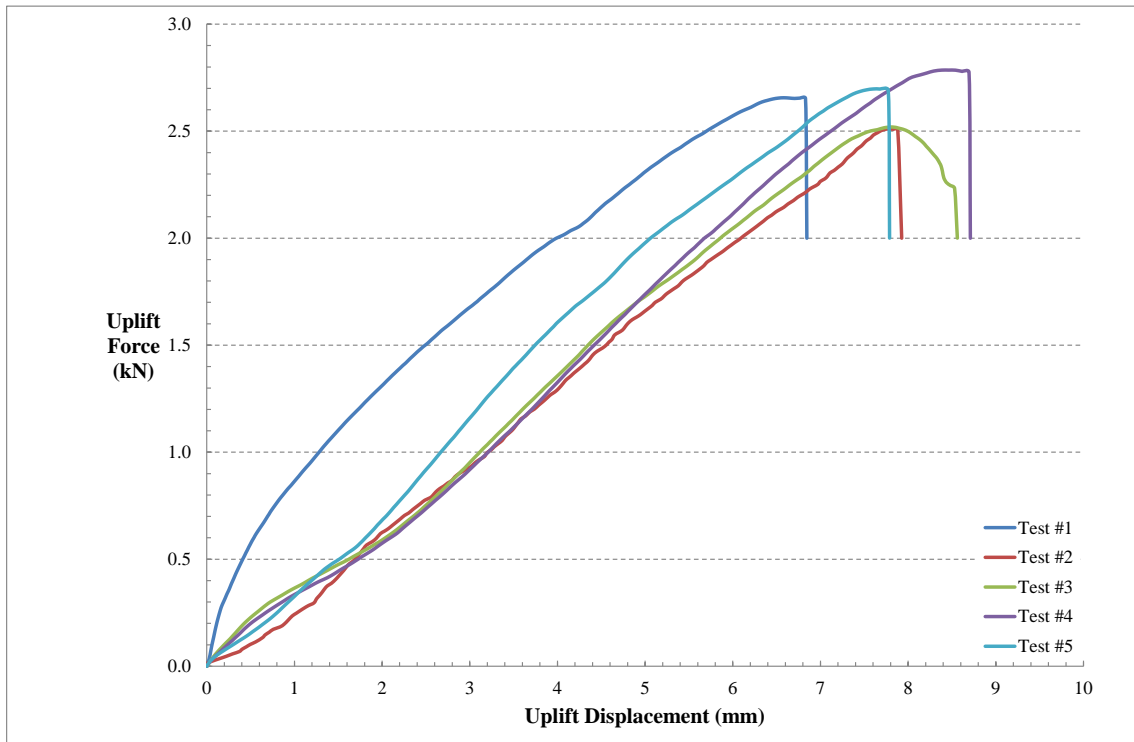


FIG.9
GM-MRH-20-AZ, KLIPLOK 406
LOAD VS DISPLACEMENT GRAPH

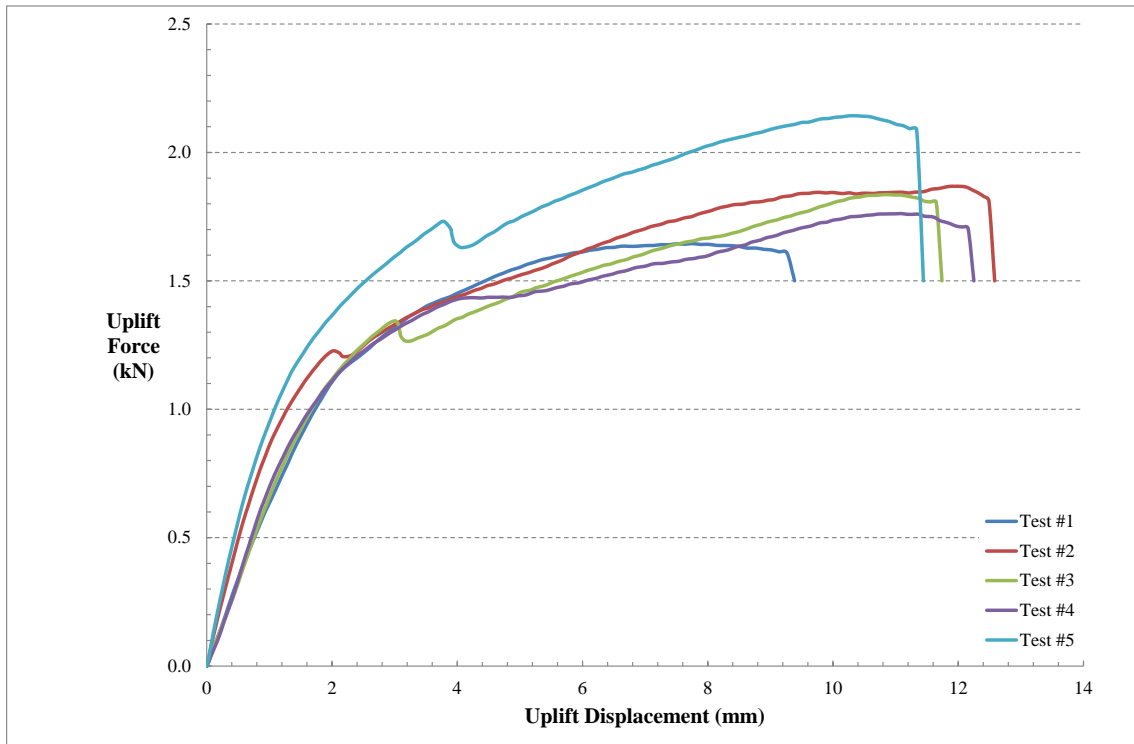


FIG.10
GM-MRH-18-AZ, LONGLINE 305
LOAD VS DISPLACEMENT GRAPH

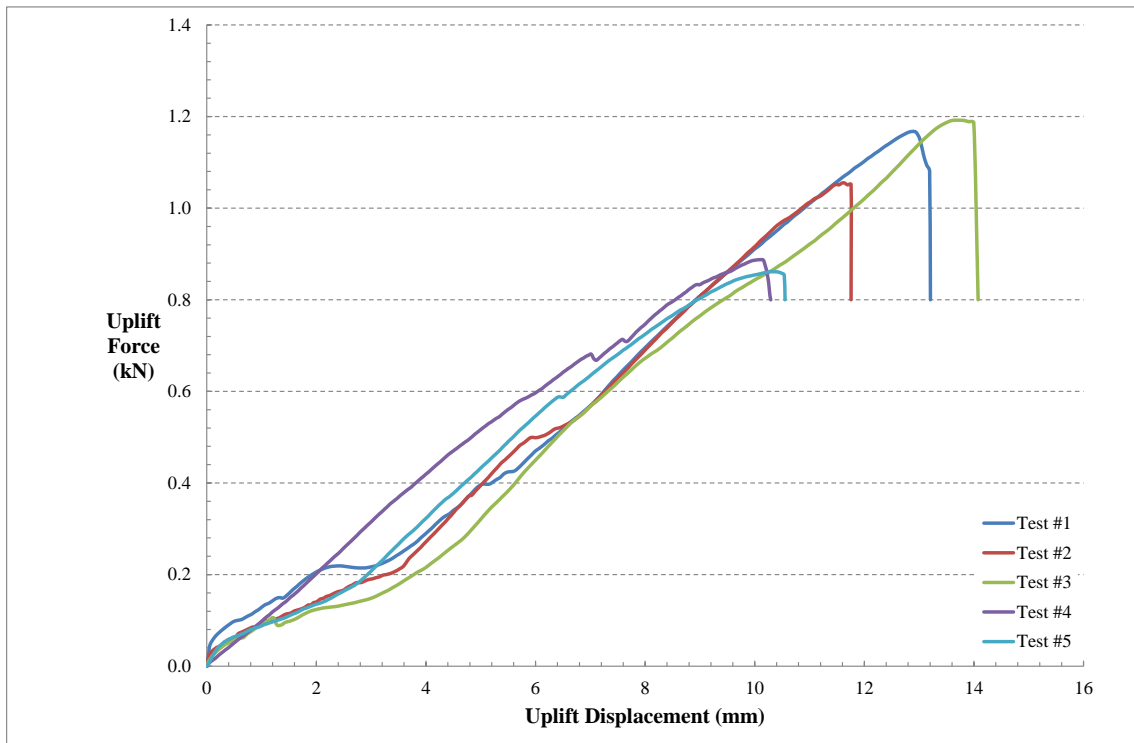


FIG.11
GM-MRH-T4-AZ, TRIMDEK
LOAD VS DISPLACEMENT GRAPH

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