



0013

TEST REPORT

Lucideon Reference: UK21572 (QT61048/3/JB)/Ref. 1

Project Title: Racking Testing of STS Construction Board Carried out in Accordance with BS EN 594:2011

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Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

UKAB No. 1289.

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1 INTRODUCTION

STS Ltd supplied fibre cement boards to Lucideon Limited to be installed onto timber frame panels to establish racking resistance in accordance with BS EN 594:2011 Timber structures - Test methods - Racking strength and stiffness of timber frame wall panels.

Testing was carried out from 8 June until 10 June 2021.

2 SAMPLE DESCRIPTION

The client supplied 12 mm fibre cement boards referred to as 'STS Construction Boards' with nominal dimensions 2400 mm x 1200 mm at the request of Lucideon Limited.

Six racking panels were constructed by a technician from Lucideon Limited.

The timber frame panel was of overall size 2400 mm x 2400 mm and comprised of C16 38 mm x 90 mm x 2324 mm timber studs at nominally 600 mm centres, together with a single bottom rail and single top rail. A head binder was used above the top rail but not fixed to the sheathing.

A bead of MegaStrength PU adhesive was applied on to the studs and 2400 mm x 1200 mm x 12 mm thick sheathing boards were placed on top. The boards were then screwed to the face of the timber frame at 150 mm centres to the perimeter and 300 mm centres to the internal studs, using STS 38 mm fibre cement board screws.

The general arrangement of the panel is shown in Figure 1 of BS EN 594:2011.

Plate 1 shows the test set-up.

3 TEST PROGRAMME

- Three racking panels were tested with 0 kN top load applied.
- Three racking panels were tested with 5 kN/stud top load applied.

4 INSTRUMENTATION

Table 1 – Instrumentation

Equipment	Laboratory Number
Load cell (1)	FOR005
Load cell (2)	FOR006
Linear voltage displacement transducer (LVDT) 1	TRD025
Linear voltage displacement transducer (LVDT) 2	TRD026
Linear voltage displacement transducer (LVDT) 3	TRD027

5 TEST PREPARATION

18 mm diameter holes were cut in the base rail, centred at the anchorage points of the base rig. M16 x 150 mm long bolts were inserted through the holes with large steel plates attached (50 mm wide x 220 mm long x 10 mm thick).

The test panel was bolted to the test rig through a 38 x 89 mm C16 timber rail such that the bottom rail was fixed down by five M16 x 150 mm long bolts in line with BS EN 594:2011 and is shown in Figure 2. The panel was laid flat in the test rig, which had been bolted down to the laboratory strong floor. The panel was placed on Teflon™ coated timber packers to allow it to move freely when loading. Hydraulic rams were fixed to the test rig at the panel header end such that they would be able to apply a vertical top load to the panel at the 600 mm centres.

In accordance with Figure 3 of BS EN 594:2011, LVDTs were fixed in place so as to record horizontal deflection at the head of the panel (Displacement 1), at the base of the panel (Displacement 2) and to measure any uplift at the base of the panel (Displacement 3). The temperature at the time of testing was 20.4°C and humidity was at 52%.

6 METHOD OF TEST

6.1 0 kN/stud Vertical Load

Using hydraulic rams linked via a common manifold, a vertical pre-load of 1 kN/stud was applied to the panel and left for 2 minutes prior to removal. The panel was then allowed to recover for 5 minutes before applying a racking load at a loading rate such that 90% of the maximum load of the panel was achieved within 300 seconds (± 120 seconds). The load and displacement were monitored throughout testing via load cells and LVDTs, respectively and recorded via a data logger.

6.2 5 kN/stud Vertical Load

Using hydraulic rams linked via a common manifold, a vertical pre-load of 5 kN/stud was applied to the panel and maintained throughout testing. A racking load was then applied at a loading rate such that 90% of the maximum load of the panel was achieved within 300 seconds (± 120 seconds). The load and displacement were monitored throughout testing via load cells and LVDTs, respectively and recorded via a data logger.

7 RESULTS

The racking stiffness (R) and F_{max} for the panels are given in Tables 2-3.

On the request of STS Ltd, test racking resistance (kN/m) calculations were carried out in accordance with BS 5268 Structural use of timber - Part 6: Code of practice for timber frame walls - Section 6.1: Dwellings not exceeding seven storeys.

Load deflection curves can be seen in Charts 1-2.

The typical failure mode is shown in Plate 2.

TABLES

Table 2 – Results for Racking Testing Carried out with 0 kN/stud Top Load

Panel	Top Load (kN/stud)	Test Racking Stiffness (N/mm)	FMax (kN)	Calculated Test Racking Resistance (BS 5268) (kN/m)	Comments
1	0	2267	20.41	4.53	Failure occurred due to timber pulling away from the rail
2		2056	19.43		
3		2511	18.71		

Table 3 – Results for Racking Testing Carried out with 5 kN/stud Top Load

Panel	Top Load (kN/stud)	Test Racking Stiffness (N/mm)	FMax (kN)	Calculated Test Racking Resistance (BS 5268) (kN/m)	Comments
1	5	2032	27.64	2.31	Failure occurred due to timber pulling away from the rail
2		1762	23.70		
3		1932	25.32		

In accordance with BS EN 5268-61, a single boarded panel requires a calculated test racking resistance of 1.68 kN/m to achieve a Category 1 material.

The results achieved by STS construction boards far exceeded this value so, therefore, fall into the Category 1 grade.

NOTE: The results given in this report apply only to the samples that have been tested.

END OF REPORT

PLATES

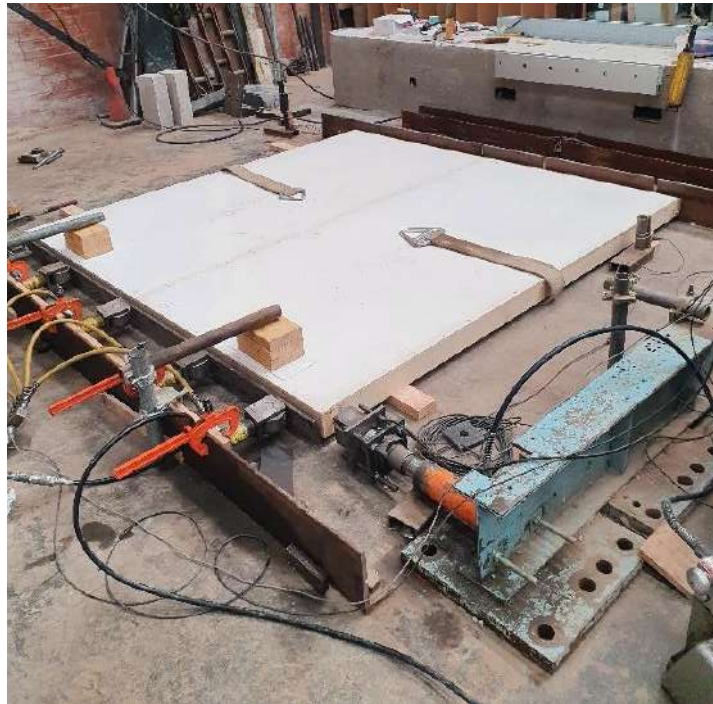


Plate 1 – General View of Racking Test Arrangement



Plate 2 – Typical Mode of Failure

Chart 1 - Load Deflection Curves for Racking Testing Carried out with 0 kN/stud Top Load



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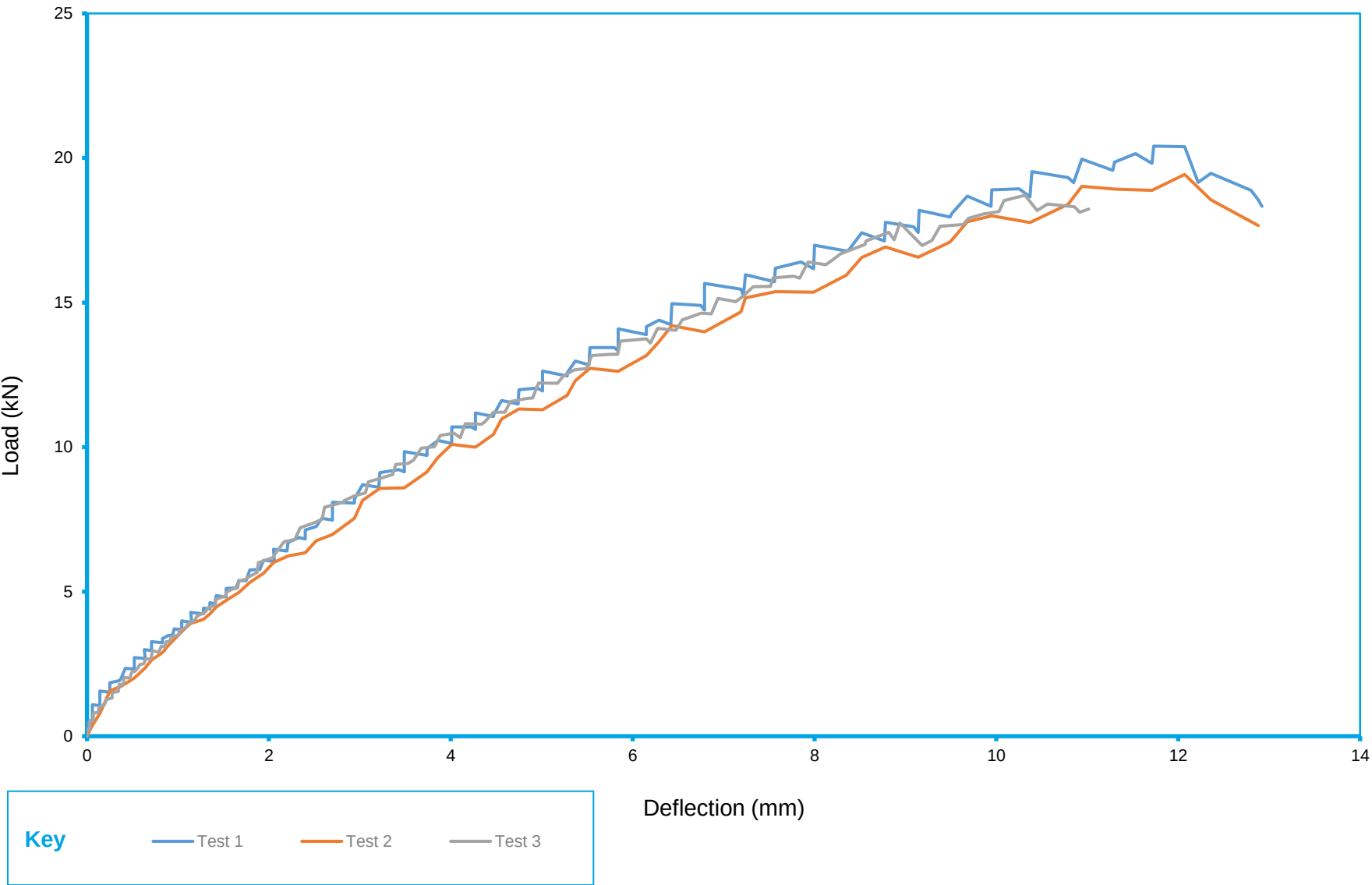


Chart 2 - Load Deflection Curves for Racking Testing Carried out with a 5 kN/stud Top Load



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