



0013

## TEST REPORT

**Lucideon Reference:** 151648 (QT36150/1/SL)/Ref. 1

**Project Title:** Racking Tests on Enviroboards 9 mm Fireboard Fixed to Timber Frame Panels to BS EN 594:2011

**Client:** Enviroboards Ltd  
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**Work Location:** Lucideon UK

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

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## 1 INTRODUCTION

Enviroboards Ltd supplied timber frame panels sheathed with 9mm Magnesium Oxide sheathing boards referenced as Fireboard to Lucideon, to establish racking resistance in accordance with BS EN 594:2011 Timber Structures – Test Methods. Racking strength and stiffness of the panel were determined according to Section 6.5 of BS EN 594:2011.

## 2 TEST PROGRAMME

The samples were received and tested under racking load when subjected to different vertical top loading conditions, as follows:

| Panel Reference                   | Vertical Top Load at 600 mm Centres (kN) | Tests | Sheathing Board Thickness (mm) | Perimeter Nailing Centres (mm) | Intermediate Nailing Centres (mm) |
|-----------------------------------|--|-------|--------------------------------|--------------------------------|-----------------------------------|
| Enviroboards<br>9 mm<br>Fireboard | 0  | 3     | 9                              | 150                            | 300                               |
|                                   | 5  | 3     |                                |                                |                                   |

## 3 SAMPLE DESCRIPTION

Each timber frame panel was of overall size 2400 mm wide x 2438 mm tall and comprised 38 x 89 mm C16 studs at nominally 600 mm centres, together with a single top rail. A head binder was used above the top rail but not fixed to the sheathing.

1.2 m x 2.438 mm x 9mm thick sheathing boards were nailed to the face of the timber frame at 150 mm centres to the board perimeter and 300 mm centres to the internal studs.

The general arrangement of the panel and fixing positions is shown in Figure 1.

## 4 TEST PREPARATION

100 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 the 38 x 89 mm C16 timber rail such that the bottom rail was fixed down by 5 No. M16 x 150 mm long bolts in line with BS EN 594 and 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, linear voltage displacement transducers (LVDT's) 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 positions are shown in Figure 2 along with a general view of the test arrangement.

The temperature and humidity as measured by a calibrated hygrometer was 20.6°C and 51.4% RH.

## 5 METHOD OF TEST

### 5.1 0 kN Vertical Load per Stud

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  $\pm$  200 seconds.

### 5.2 5 kN Vertical Load per Stud

A vertical load of 5 kN/stud was applied to the panel and maintained for the duration of the test. A racking load was applied at a loading rate such that the 90% of the maximum load of the panel was achieved within 300 seconds  $\pm$  200 seconds.

## 6 RESULTS

The ultimate racking loads, the racking stiffness and basic test racking resistance are given in Table 1.

Graphs of applied racking load against deflection are given in Charts 1 and 2.

The typical failure modes are shown in Plate 1-2.

## 7 DISCUSSION

According to BS 5268-6.1<sup>1</sup> a Category 1 material (9.5 mm plywood, 9.0 mm medium board, 12.0 mm chipboard, 9.0 mm OSB) nailed at a maximum spacing of 150 mm on perimeter and 300 mm on internal studs should give a Racking resistance of 1.68 kN/m.

The Enviroboards 9 mm Fireboard sheathed timber frame panels nailed at 150 mm centres to the board perimeter and 300 mm centres to the internal studs achieved calculated basic test racking resistance values of 1.75 kN/m with no vertical load and a value of 1.93 kN/m with 5 kN/m applied vertical load.

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

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<sup>1</sup> BS 5268-6.1 Structural use of timber. Part 6 code of practice for timber frame walls. Part 6.1 Dwellings not exceeding seven stories



**Table 1** - Summary of Racking Loads for Panels Tested with Enviroboards 9 mm Fireboards Fixed at 150 mm Centres to the Board Perimeter and 300 mm Centres to the Internal Studs

| Panel       | Load per Stud (kN) | Racking Stiffness (N/mm) | Racking Strength Fmax (kN) | Basic Test Racking Resistance to BS 5268-6.1 (kN/m) | Mode of Failure  |
|-------------|--------------------|--------------------------|----------------------------|---|--|
| 1           | 0                  | 1855                     | 7.24                       | 1.75  | Withdrawal of leading stud with failure of sheathing board at base rail-fixings pulling through.   |
| 2           |                    | 2741                     | 7.26                       |   |  |
| 3           |                    | 1499                     | 7.27                       |   |  |
| <b>Mean</b> | -                  | <b>2032</b>              | <b>7.26</b>                | -   | -  |
| 1           | 5                  | 1711                     | 14.46                      | 1.93  | Failure of board around fixings at the base rail corner with differential movement between panels. |
| 2           |                    | 1502                     | 14.49                      |   |  |
| 3           |                    | 1462                     | 14.11                      |   |  |
| <b>Mean</b> | -                  | <b>1558</b>              | <b>14.35</b>               | -   | -  |

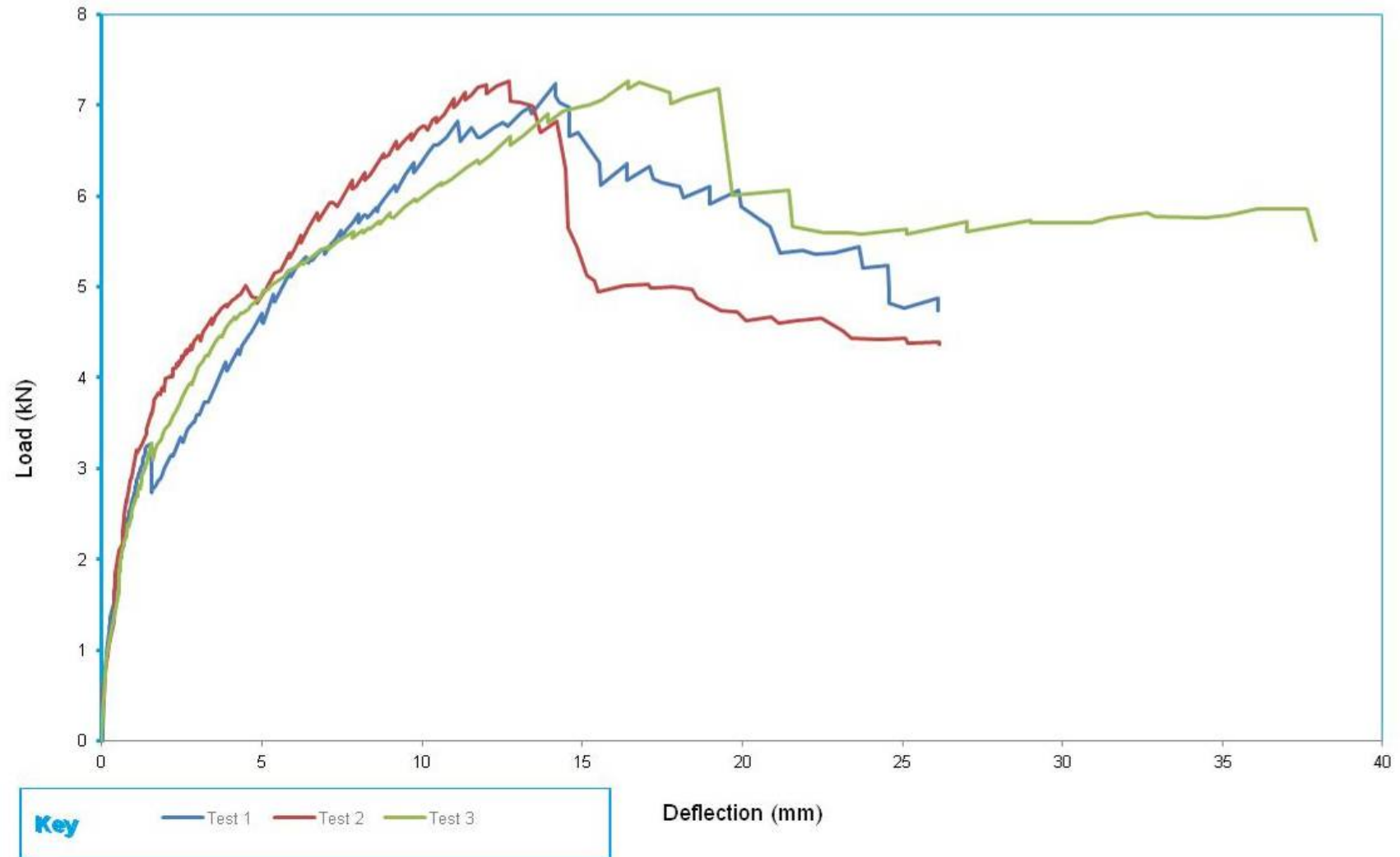


**Plate 1** – Typical Mode of Failure after 0 kN Vertical Top Load Tests

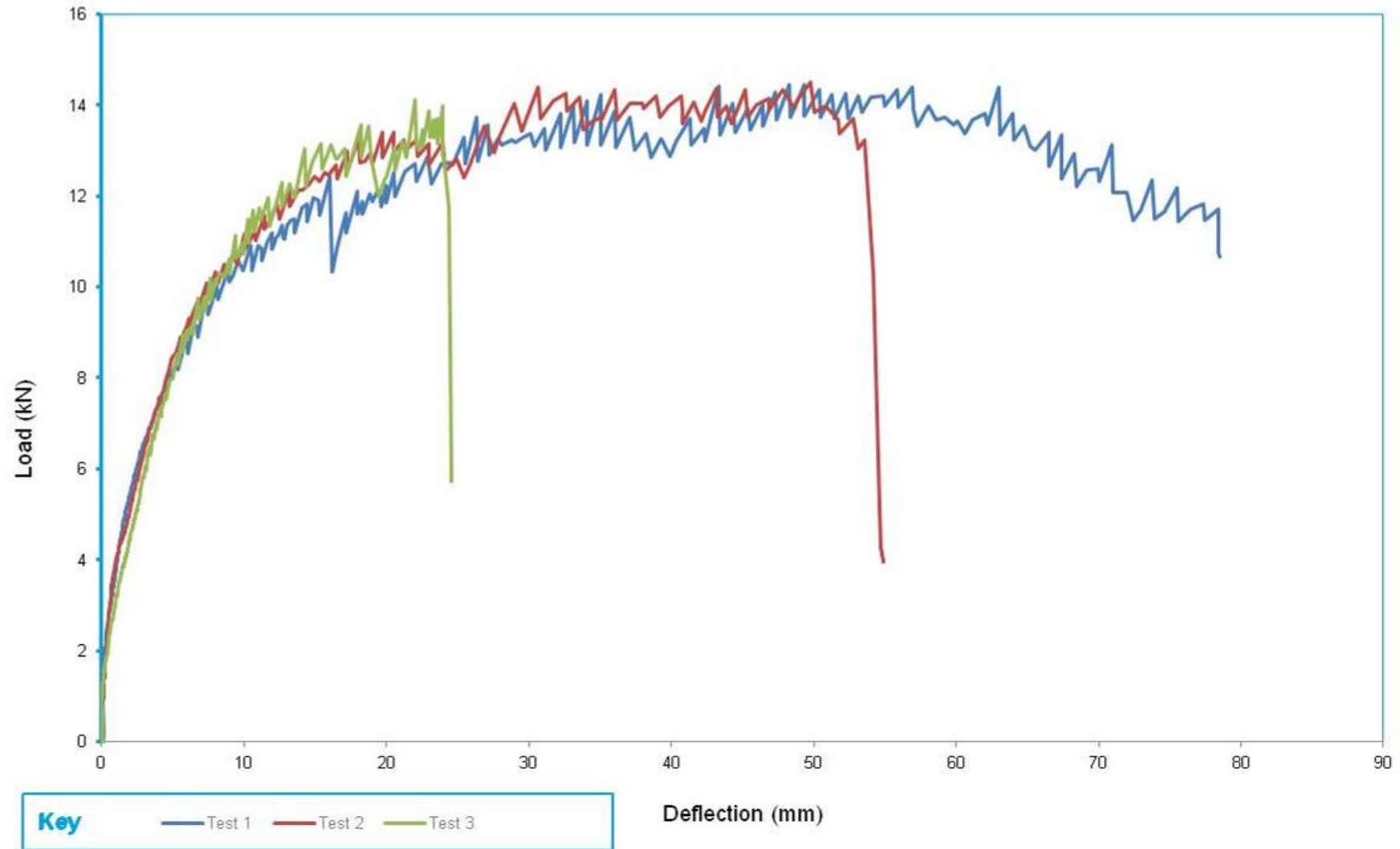


**Plate 2** – Typical Mode of Failure after 5 kN Vertical Top Load Tests

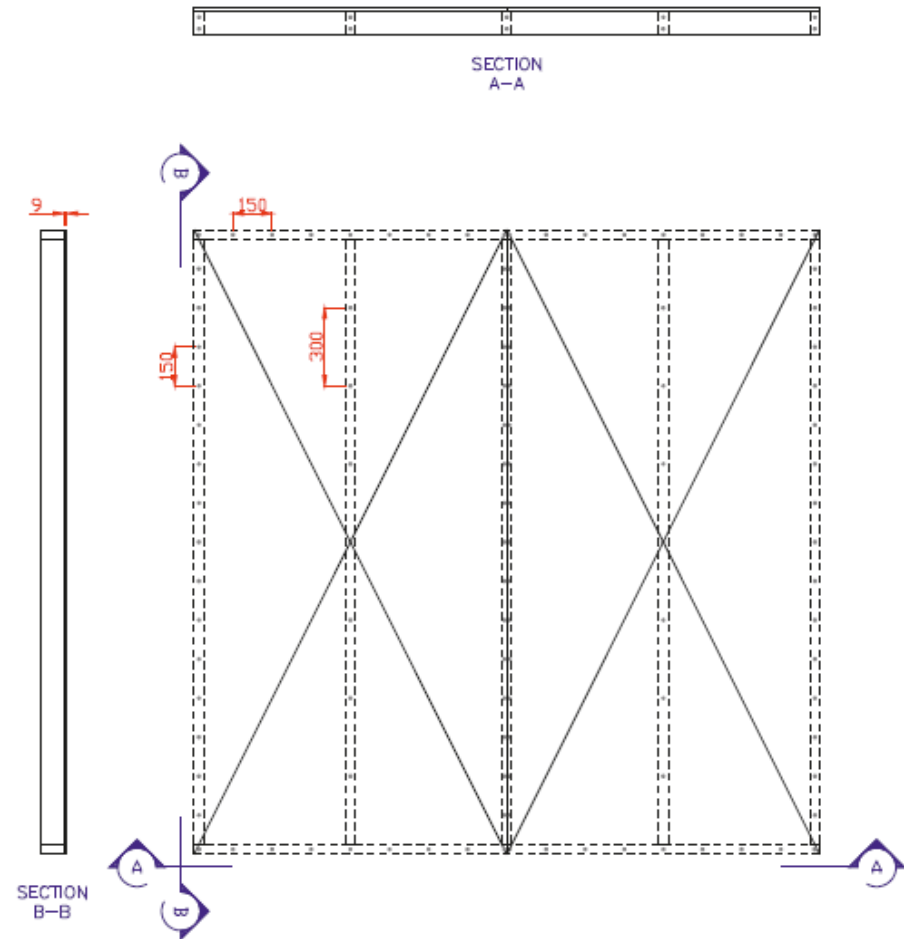
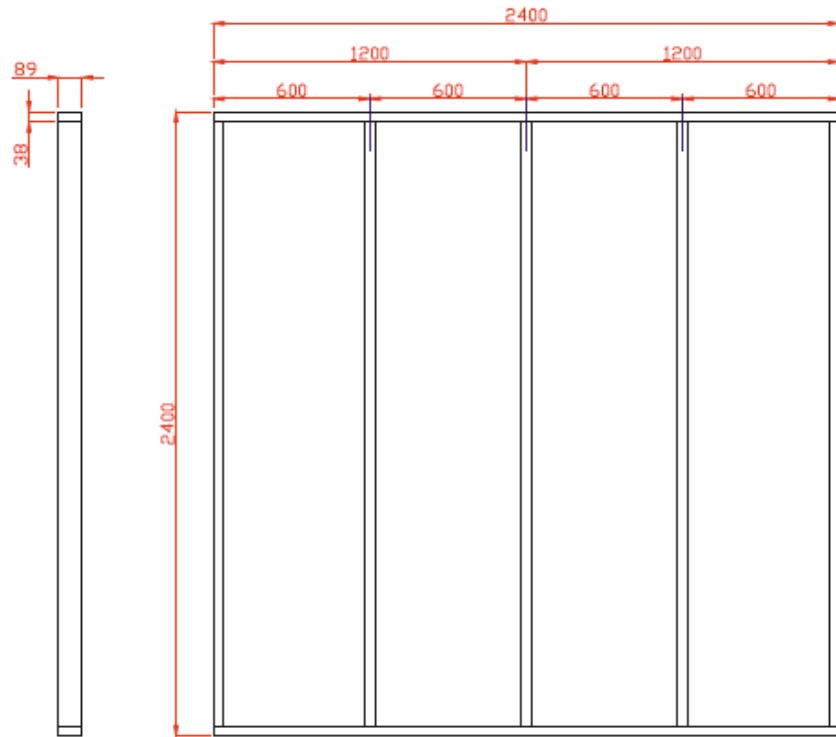
Chart 1 - Racking Load vs. Deflection for Enviroboards Timber Frame Panel - 0 kN



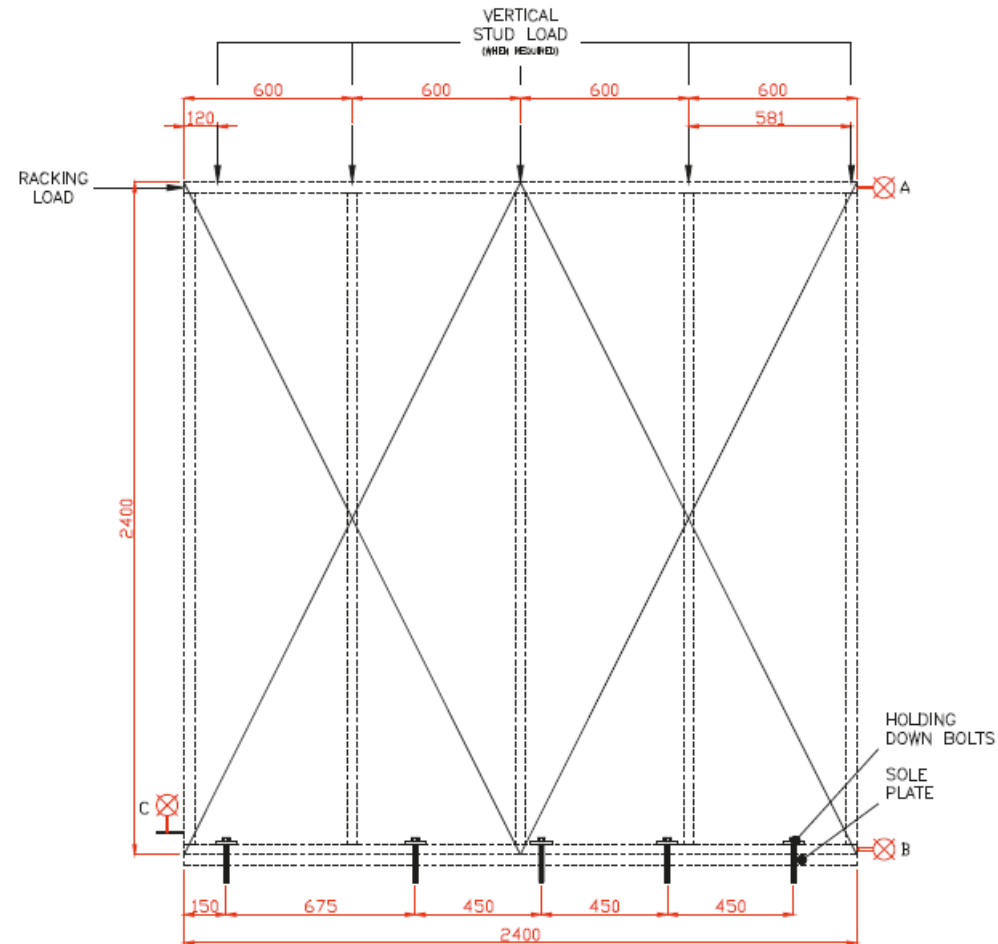
**Chart 2 - Racking Load vs. Deflection for Enviroboards Timber Frame Panel – 5 kN**







|  |                               |                            |                               |
|--|-------------------------------|----------------------------|-------------------------------|
| DWG.N°:<br><b>Figure 1</b>                               | SCALE:<br><b>NOT TO SCALE</b> | DATE:<br><b>14/05/2015</b> | DRAWN BY:<br><b>A BELLAMY</b> |
| TITLE:<br><b>Detail and dimensions for racking panel</b> |                               |                            |                               |



|   |                               |                            |                               |
|---|-------------------------------|----------------------------|-------------------------------|
| DWG.N°:<br><b>Figure 2</b>                                    | SCALE:<br><b>NOT TO SCALE</b> | DATE:<br><b>14/05/2015</b> | DRAWN BY:<br><b>A BELLAMY</b> |
| TITLE:<br><b>Detail and dimensions for racking test setup</b> |                               |                            |                               |