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COMPOSITE DECKING JOISTS LOAD TESTING

DOCUMENT REFERENCE: DR-5200
PROJECT FILE REFERENCE: S10276

Prepared for: Cladco Profiles Limited
Beardown road, Exeter Road Industrial Estate, Okehampton, EX20 1UA

Revision	Date	Reason for Issue:
Rev0	25/02/2019	Draft For Internal Review
Rev1	25/02/2019	First Issue for Comment

Contents

APPENDIX:

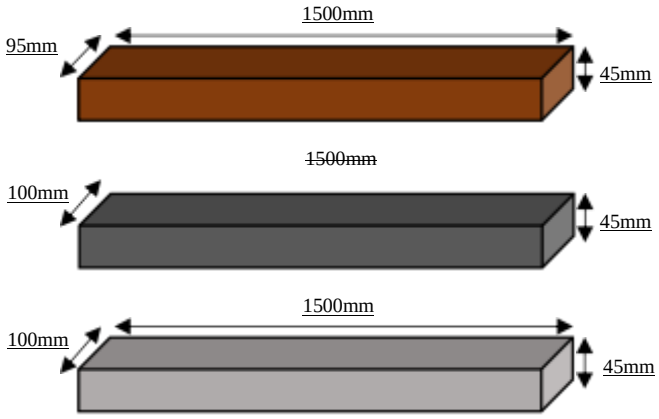
1. Introduction

STS (U.K) Group were commisioned by Cladco Profiles Limited to undertake a series of failure load tests on three specimens of decking joists. All testing was carried out by STS (U.K). The purpose of the testing was to attain results and findings that could be analysed to see the difference between the solid joists, the chambered joists and conventional wooden joists. Each component was inspected for damage before and after testing was carried out.

The testing was carried out on three different specimens. This was done to achieve an average in results and definitive failure limit of the two types of wood-plastic decking tested, along with the failure limit for comparison of conventional timber joisting. The results of these tests can be found in section 3 of this report.

The components tested and the tests carried out were as follows:

- 3No Failure Tests – 1500mm x 100mm x 45mm Specimens of the Chambered Composite (Hollow) Joists load tested to failure.
- 3No Failure Tests – 1500mm x 100mm x 45mm Specimens of the Solid Composite Joists load tested to failure.
- 3No Failure Tests – 1500mm x 95mm x 45mm Specimens of the Solid Timber Joists load tested to failure.



Diagrams 1, 2 & 3 – (Top) Solid Wooden Joist. (Middle) Chambered Joist with 2 Hollowed Chambers. (Bottom) Solid Joist.

The testing took place at the following address:

Site Address: Unit 4, Poole Hall Business Park, Poole Hall Road, Ellesmere Port, Cheshire, CH66 1AU

2. Methodology

To accurately determine the maximum loading the Wood-Plastic Composite Hollow and Solid Joists could withstand, a series of load tests were undertaken.

During the tests, the load was applied using a hydraulic cylinder attached to a pressure sensor. This allowed us to monitor the load during each test. The load was applied over an area of 100mm x 100mm positioned centrally over a span of 1000mm. The displacement was monitored continuously throughout each test. This was measured using a 1250mm Drawstring Potentiometer situated outside the zone of influence on a freestanding tripod and recorded using a bespoke logging system. Displacements were to be plotted to a screen such that any non-elastic displacement will be instantly identified. After applying the load the test will be complete and the load removed.

The testing was carried out on the three samples of the Solid and Chambered Composite Joists as well as three samples of Solid Wooden Joists to determine the structural failure limit of all three types of joist. The samples were loaded continuously until a failure had been achieved. All the tests were identical and were used to find an average in results of the three types of joist. (Results for these tests can be found in Section 3 and Appendix A of this report). Conducting three of these tests allowed us to gain an average in results. The load was applied via a hydraulic cylinder situated directly central and above each sample. The load was applied by way of an electric pump in a steady manner and displacement was recorded prior to load, during the test and after the speciment had failed.

2.1 Initial Survey

Prior to any load testing, all specimens were examined for any signs of damage to the surface and any signs of cracks or stress to the specimen. Any defects encountered were noted down and photographic records taken.

3. Findings

All certificates can be found in Appendix A of this report.

Below is a table containing the maximum loads achieved over the three tests carried out on each sample tested. In the final column is the average loading required to break each type of joist. Each sample was braced over a span of 1000mm and the load was applied centrally along a 100mm x 100mm plate.

	Test 1	Test 2	Test 3	
Sample Type	Max Load Achieved (kgs)	Max Load Achieved (kgs)	Max Load Achieved (kgs)	Average Failure Load (kgs)
Solid Composite Joist	795	793	923	837
Solid Wooden Joist	754	752	781	762
Chambered Composite Joist	746	799	859	801

Table 1 – Test Results from the Failure Load Testing on the Chambered Composite, Solid Composite and Solid Wood Joist Specimens.

4. Conclusion

Following the results found in section 3 of this report, it can be said that the readings attained during the failure load testing proved the Solid Composite Joist achieved the highest single load required to be applied before failure as well as the highest of all the average loads required to fail each sample. The Solid Wooden Joist appeared to be the weakest on average with an (Average) load required of 762kgs needed to break each sample. The Chambered Composite Joist achieved an average loading of 801kgs and the Solid Composite Joist achieved an average loading of 837kgs required before failure occurred.

All the results found in this report were acquired using a custom-built logging system along with all relevant information gathered on the dates of testing, when testing in the method that is described in this report in Section 2.

	Name	Signature	Date
Created By: Snr Technician	Andrew Mercer		22.02.2018
Checked By: Technical Director	Andrew Gore		22.02.2018

For and on behalf of Specialist Technical Services (U.K) Limited

APPENDIX A

TEST CERTIFICATES

TEST CERTIFICATE

WOOD-PLASTIC JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – SOLID JOIST

TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the solid wood-plastic joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 solid samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7955	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 1 – Solid Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
795	17.45

ANALYSIS:

The Solid Joist when assembled and tested in the manor indicated within this certificate achieved a load of 795kg with a maximum recorded displacement of 17.45mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

WOOD-PLASTIC JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – SOLID JOIST

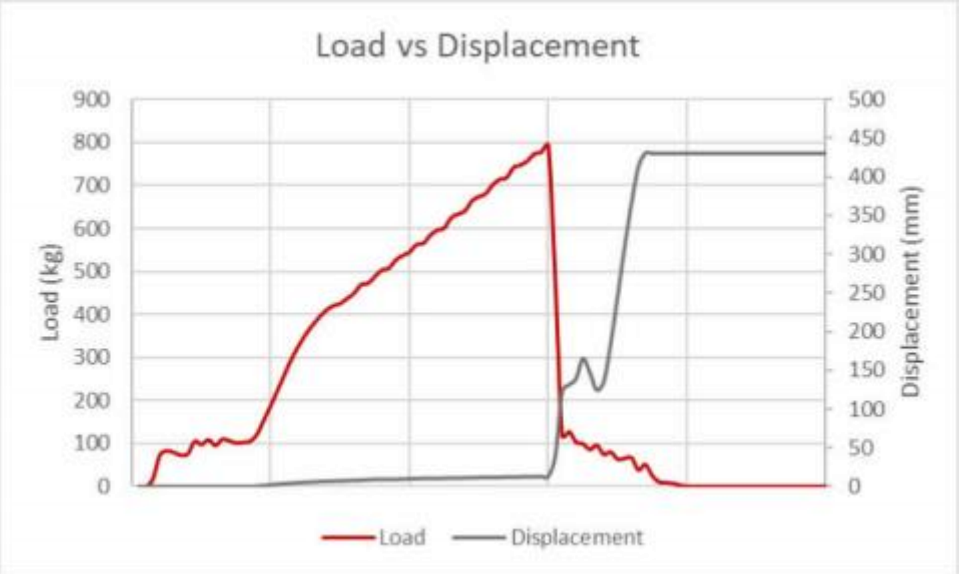
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the solid wood-plastic joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 solid samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7956	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 2 – Solid Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
793	13.11



ANALYSIS:

The Solid Joist when assembled and tested in the manor indicated within this certificate achieved a load of 793kg with a maximum recorded displacement of 13.11mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

WOOD-PLASTIC JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – SOLID JOIST

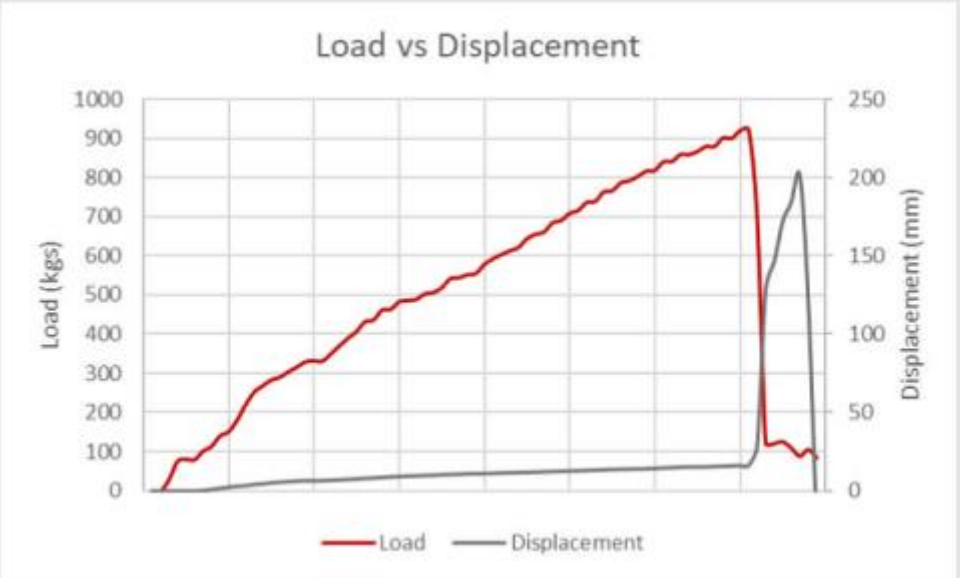
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the solid wood-plastic joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 solid samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7957	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 3 – Solid Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
923	16.45



ANALYSIS:

The Solid Joist when assembled and tested in the manor indicated within this certificate achieved a load of 923kg with a maximum recorded displacement of 16.45mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

WOOD-PLASTIC JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – HOLLOW JOIST

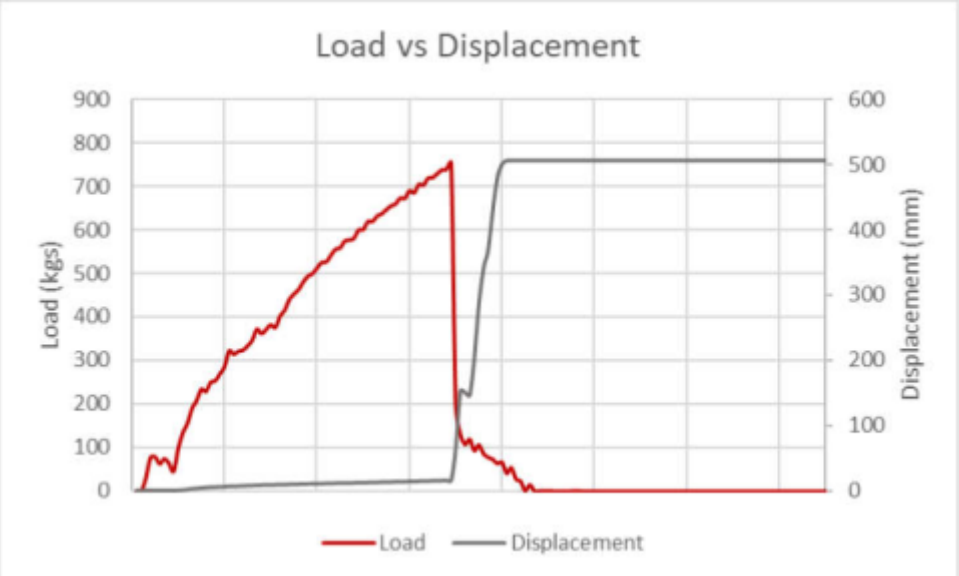
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the hollow wood-plastic joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 hollow samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7958	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 4 – Hollow Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
754	15.67



ANALYSIS:

The Hollow Joist when assembled and tested in the manor indicated within this certificate achieved a load of 754kg with a maximum recorded displacement of 15.67mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

WOOD-PLASTIC JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – HOLLOW JOIST

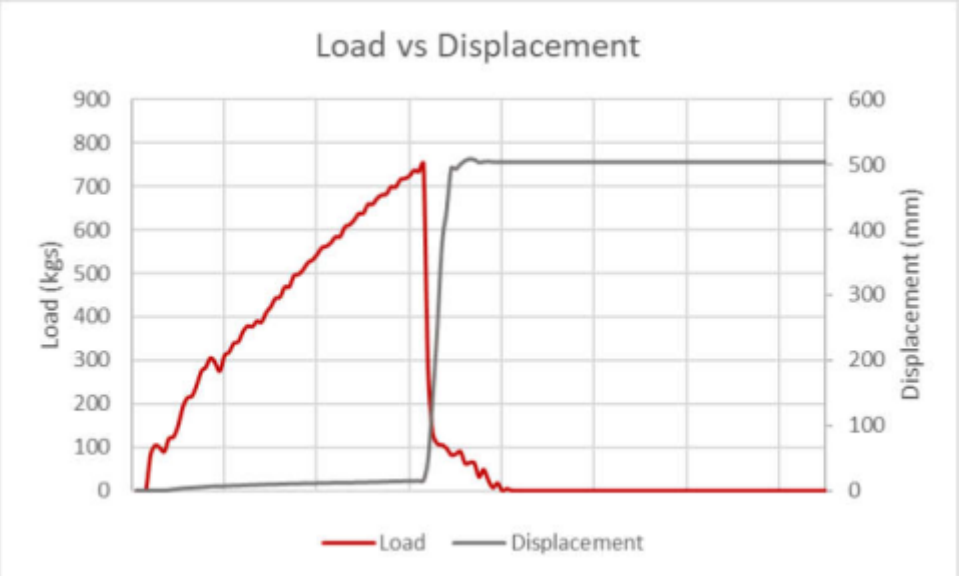
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the hollow wood-plastic joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 hollow samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7959	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 5 – Hollow Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
752	15.08



ANALYSIS:

The Hollow Joist when assembled and tested in the manor indicated within this certificate achieved a load of 752kg with a maximum recorded displacement of 15.08mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

WOOD-PLASTIC JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – HOLLOW JOIST

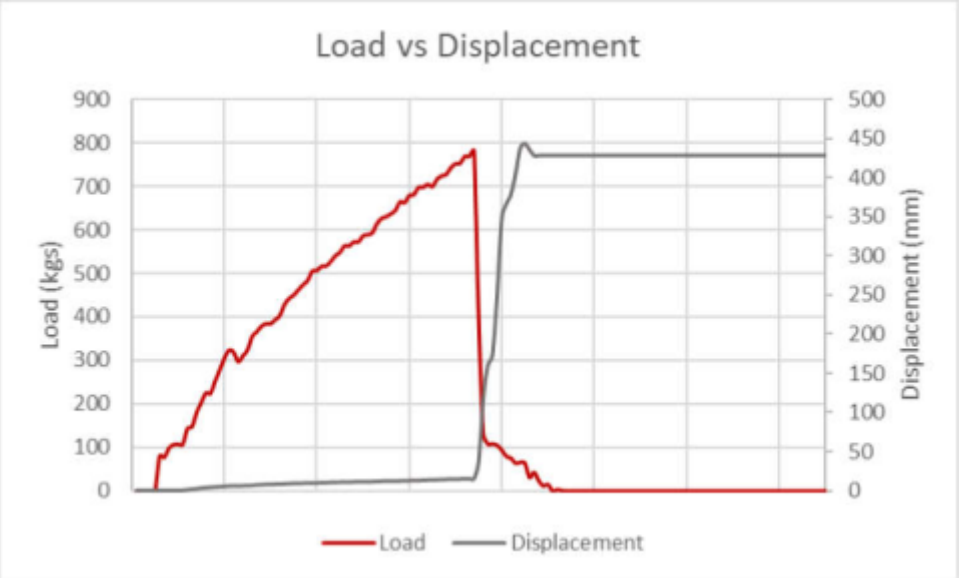
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the hollow wood-plastic joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 hollow samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7960	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 6 – Hollow Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
781	15.26



ANALYSIS:

The Hollow Joist when assembled and tested in the manor indicated within this certificate achieved a load of 781kg with a maximum recorded displacement of 15.26mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

SOLID TIMBER JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – SOLID TIMBER JOIST

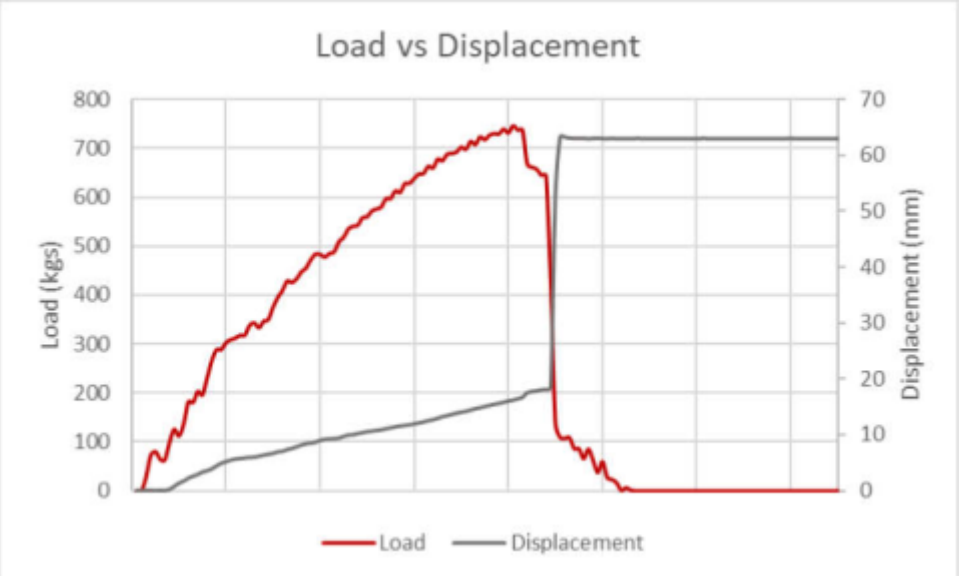
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the solid timber joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 solid timber samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7961	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 7 – Solid Timber Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
746	16.18



ANALYSIS:

The Solid Timber Joist when assembled and tested in the manor indicated within this certificate achieved a load of 746kg with a maximum recorded displacement of 16.18mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

SOLID TIMBER JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – SOLID TIMBER JOIST

TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the solid timber joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 solid timber samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7962	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 8 – Solid Timber Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Displacement (mm)
799	23.40

ANALYSIS:

The Solid Timber Joist when assembled and tested in the manor indicated within this certificate achieved a load of 799kg with a recorded displacement of 23.40mm before the sample failed. As the load relaxed on the solid timber joist, cracking occured causing the displacement to increase.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**

TEST CERTIFICATE

SOLID TIMBER JOIST LOAD TEST

On behalf of Cladco Profiles Limited
Beardown Road, Exeter Road Industrial Estate
Okehampton, Devon, EX20 1UA

LOAD TEST TO FAILURE – SOLID TIMBER JOIST

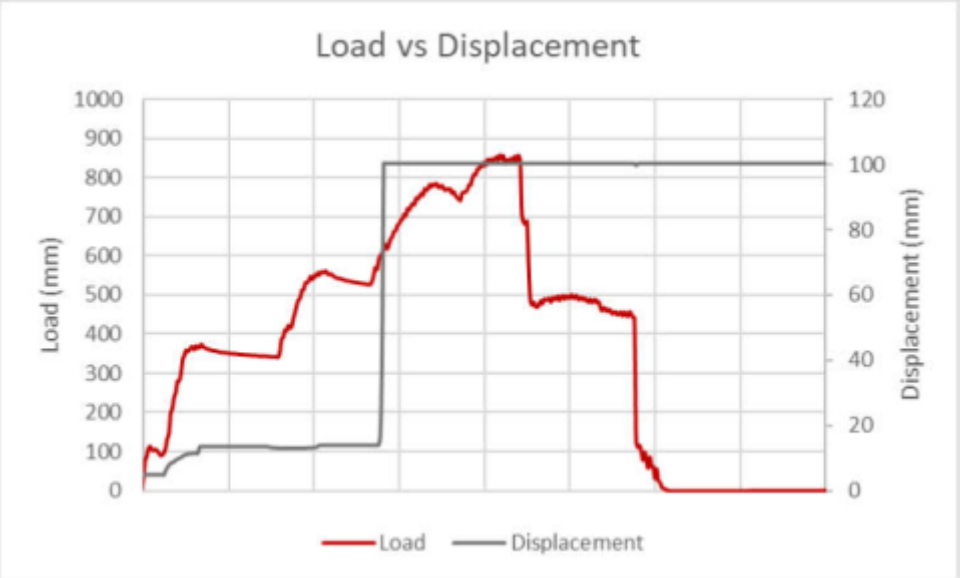
TEST DESCRIPTION: A load test was carried out to determine the maximum load required to fail the solid timber joist. The concentrated load was applied on to a 100mm plate positioned centrally over a span of 1000mm. Displacement was monitored throughout the test. A total of 3 solid timber samples were tested to failure.

REF NO.:	DR-5195	**DATE TESTED:**	8th February 2019
JOB NO.:	S10276	**DATE REPORTED:**	N/A
CERTIFICATE NO.:	IC7963	**CERTIFICATE DATE:**	13th February 2019

TEST DETAILS: Test 9 – Solid Timber Joist (Span of 1000mm)

TEST RESULTS:

Load Achieved (kgs)	Maximum Displacement (mm)
859	100.53



ANALYSIS:

The Solid Timber Joist when assembled and tested in the manor indicated within this certificate achieved a load of 859kg with a recorded maximum displacement of 100.53mm before the sample failed.

NAME: **Andrew Mercer**
POSITION: **Senior Technician**