Buttonfix Fastener Testing

for

Buttonfix Ltd

AS-22-589

12 December 2023

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Any opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

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The AMRC has prepared this report on behalf of Buttonfix Ltd.

Document revision history

Revision	Date of issue	Reason for revision or original issue
01	08 November 2023	First original issue
02	12 December 2023	Removal of references to single button material development testing at request of customer.

Table of contents

1 Introduction

This report details the testing undertaken by AMRC Labs on behalf of Buttonfix Ltd between the 9th October and the 17th October, comprising seven (7) shear tests and seven (7) pull tests.

The temperature at the time of testing was between the ranges 20.0 C and 25.2C.

The customer, Buttonfix Ltd. provided all the components required to assemble and test the Buttonfix fasteners.

Testing was undertaken in accordance with the AMRC Labs in-house test procedure TP128[1], this was developed under the AMRC ASTC ISO/IEC 17025 Flexible Scope of accreditation to meet the requirements of the customer.

The samples were received on the 3rd October 2023.

2 Test Equipment

The details of the equipment and test fixtures used for this project are presented in Tables 2.1 and 2.2.

Table 2.1 Test Equipment Detail

Description	Serial Number	Calibration Number	Quantity
1250mm Crosshead Displacement (Instron Universal test machine K4101)	K4101	59666	1
50kN Load Cell (Instron Universal test machine K4101)	65766	59664	1
ETI Temperature Sensor	D13490066	68056	1
Small Steel Angle Plate	N/A	N/A	1

Table 2.2 Test Fixture Detail

Description	Part Number/Details	Quantity
300mm Tension Link Bar	Instron link bar	1
Instron 50kN Slotted Table	N/A	1
Bolted Test Fixtures	ASTC Bolted block	1
Universal Joint	Instron UJ	1
Camera	Canon	1
Video Camera	Sony	1

3 Test Specimens

Buttonfix Ltd, provided fifty-six (56) button/button-fix assemblies fixed to 14 test panels (4 assemblies per panel) as follows.

1. 6 off Type 3 final surface mount panels (utilising a total of 24 off button/button-fix assemblies)
2. 2 off Type 3 final recessed mount panels (utilising a total of 8 off button/button-fix assemblies)
3. 6 off Type 2 current surface mount panels (utilising a total of 24 off button/button-fix assemblies)

On arrival at AMRC Labs the components were examined for any obvious damage and photographed. Sample received note AS-22-589-AMRC-SRN-231003A-01 was used to record this information.

The Type 2 and Type 3 assemblies were supplier pre-assembled on fourteen panels supplied by the customer which were then marked with an identifying unique number as shown in Figure 3.4 below.

Figure 3.1 Panel identification

The specimen reference, material and type of test is presented below in Table 3.1

Table 3.1: Specimen Reference and Configuration

Unique Specimen Number	Customer Test type	Product Material	Number of fixings per panel	Surface or Recessed mount	Load orientation
AS-22-589-2-A-1	2A	Type 3 Final	4	Surface	Shear
AS-22-589-2-A-2	2A	Type 3 Final	4	Surface	Shear
AS-22-589-2-A-3	2A	Type 3 Final	4	Surface	Shear
AS-22-589-2-B-1	2B	Type 3 Final	4	Recessed	Shear
AS-22-589-2-C-1	2C	Type 3 Final	4	Surface	Perpendicular
AS-22-589-2-C-2	2C	Type 3 Final	4	Surface	Perpendicular
AS-22-589-2-C-3	2C	Type 3 Final	4	Surface	Perpendicular
AS-22-589-2-D-1	2D	Type 3 Final	4	Recessed	Perpendicular
AS-22-589-2-E-1	2E	Type 2 Current	4	Surface	Shear
AS-22-589-2-E-2	2E	Type 2 Current	4	Surface	Shear
AS-22-589-2-E-3	2E	Type 2 Current	4	Surface	Shear
AS-22-589-2-F-1	2F	Type 2 Current	4	Surface	Perpendicular
AS-22-589-2-F-2	2F	Type 2 Current	4	Surface	Perpendicular
AS-22-589-2-F-3	2F	Type 2 Current	4	Surface	Perpendicular

4 Test Set Up

4.1 Test preparation

The test setups (Figure 4.1 and 4.2) were manufactured after discussions with Buttonfix on testing requirements. The test method and setup used for the testing is outlined in the in-house developed test procedure TP128[1].

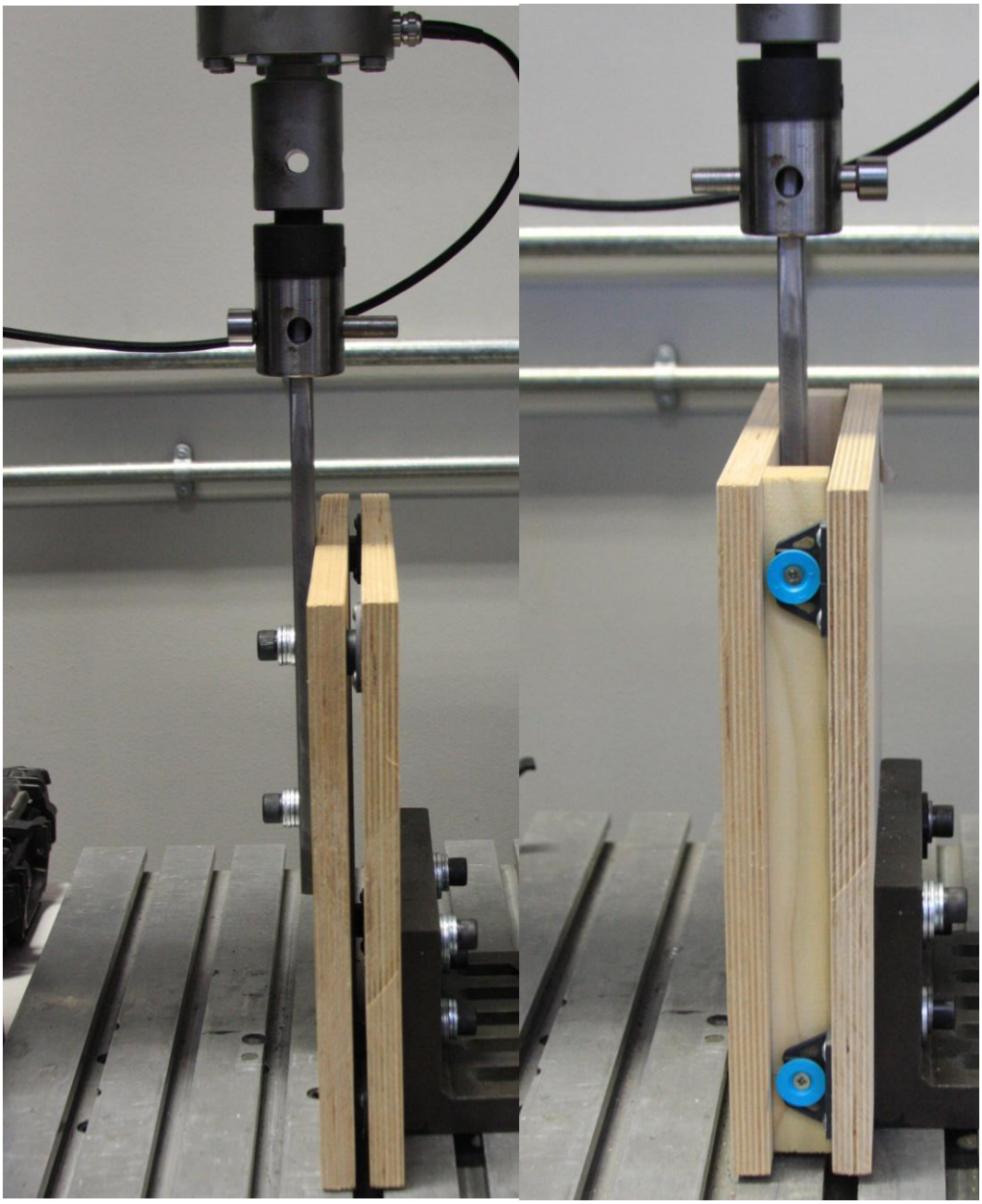

Figure 4.1: Panel Shear Test Setup

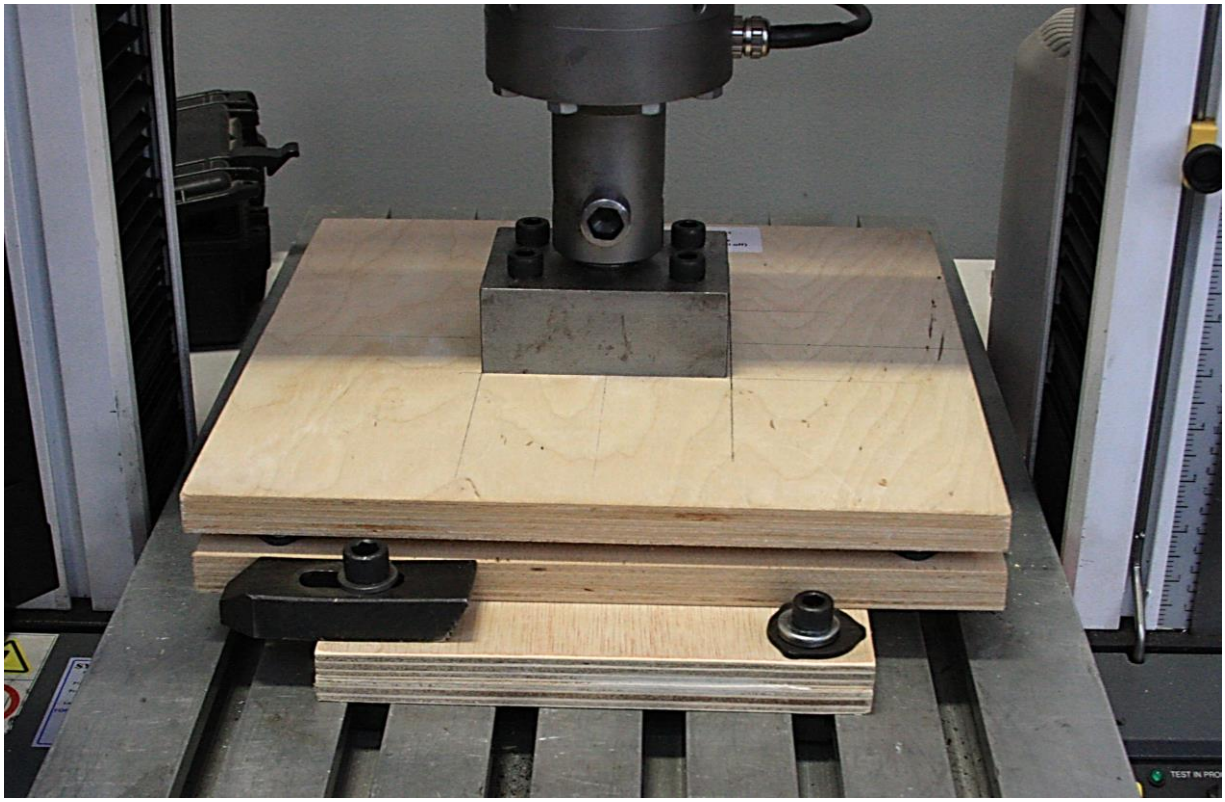

Figure 4.2: Panel Pull Out Test Setup

4.2 Test Requirements

The Customer requested that the supplied Buttonfix assemblies be subjected to shear and pull testing.

4.3 Test Programming and Validation

The Bluehill Universal software was programmed to operate the machine in displacement control, the load was monitored during the test. Programmes were saved as AS-22-589-Buttonfix Pull out and AS-22-589-Buttonfix shear.
The displacement was set at 0.25mm/sec for both programmes, a verification test was performed to confirm the displacement rate.
All results were recorded into the Log Book (AMRC.TLB) (ASTC.OP.2.1.2) and held in the electronic test folder, Appendix 1 presents the verification rate.

5 Test Results

5.1 Test Panel Shear Testing

The shear tests were performed on test panels supplied by Buttonfix Ltd, consisting of four (4) buttons and matching sockets attached to the plywood panels. The recorded data for the assemblies is presented in Table 5.3.

Table 5.1: A sample of the recorded data for the shear test assemblies

Unique Specimen Number	Buttonfix Material	Test Type	Maximum Load (N)	Displacement at Max Load (mm)
AS-22-589-2-A-1	Final	Shear	3363	4.9
AS-22-589-2-A-2	Final	Shear	3860	5.2
AS-22-589-2-A-3	Final	Shear	3015	4.8
AS-22-589-2-B-1	Final	Shear	3602	4.3
AS-22-589-2-E-1	Nylon	Shear	2224	6.9
AS-22-589-2-E-2	Nylon	Shear	2121	7.4
AS-22-589-2-E-3	Nylon	Shear	2296	7.0

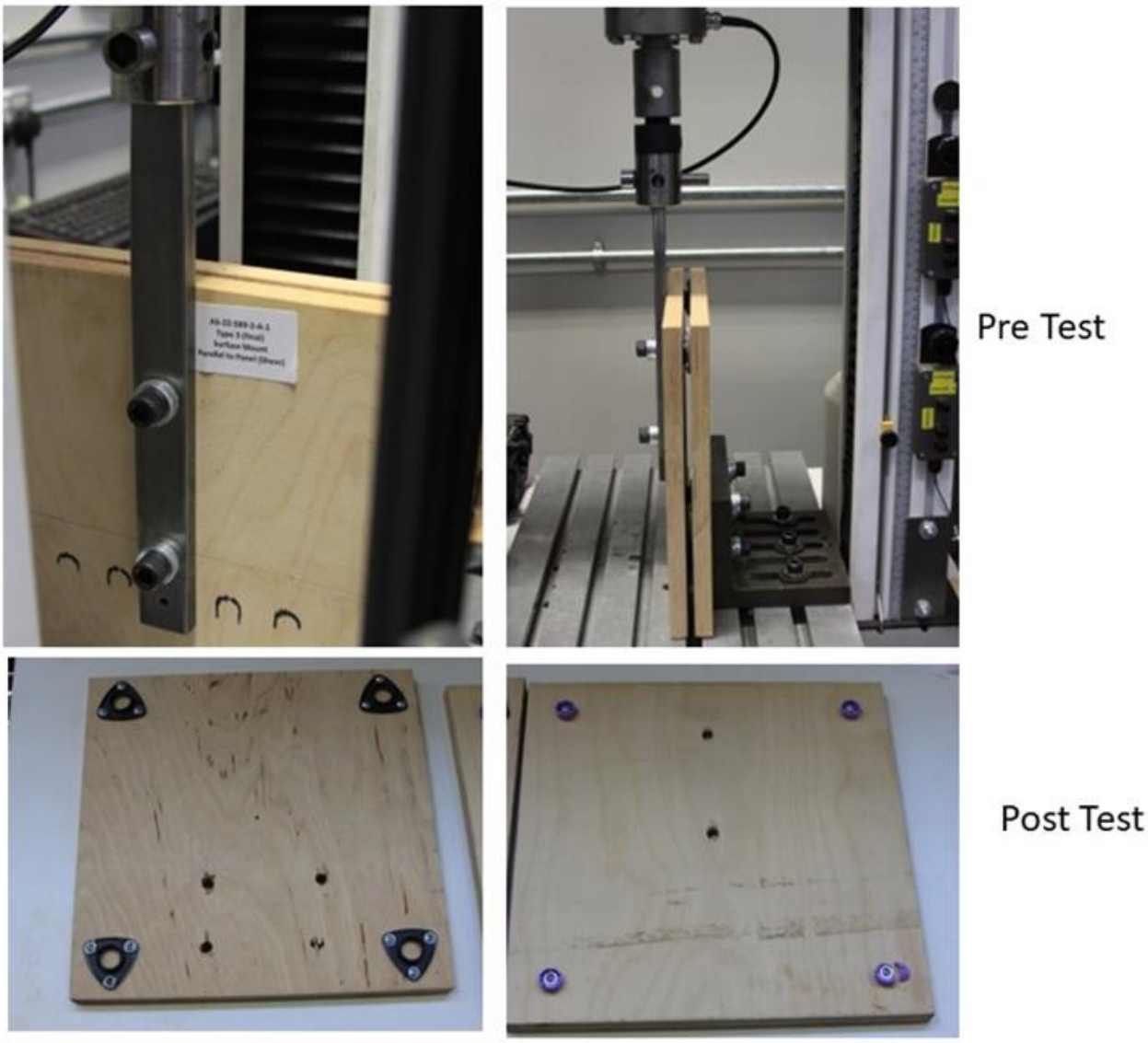

Figure 5.1 Type 3 Shear test images

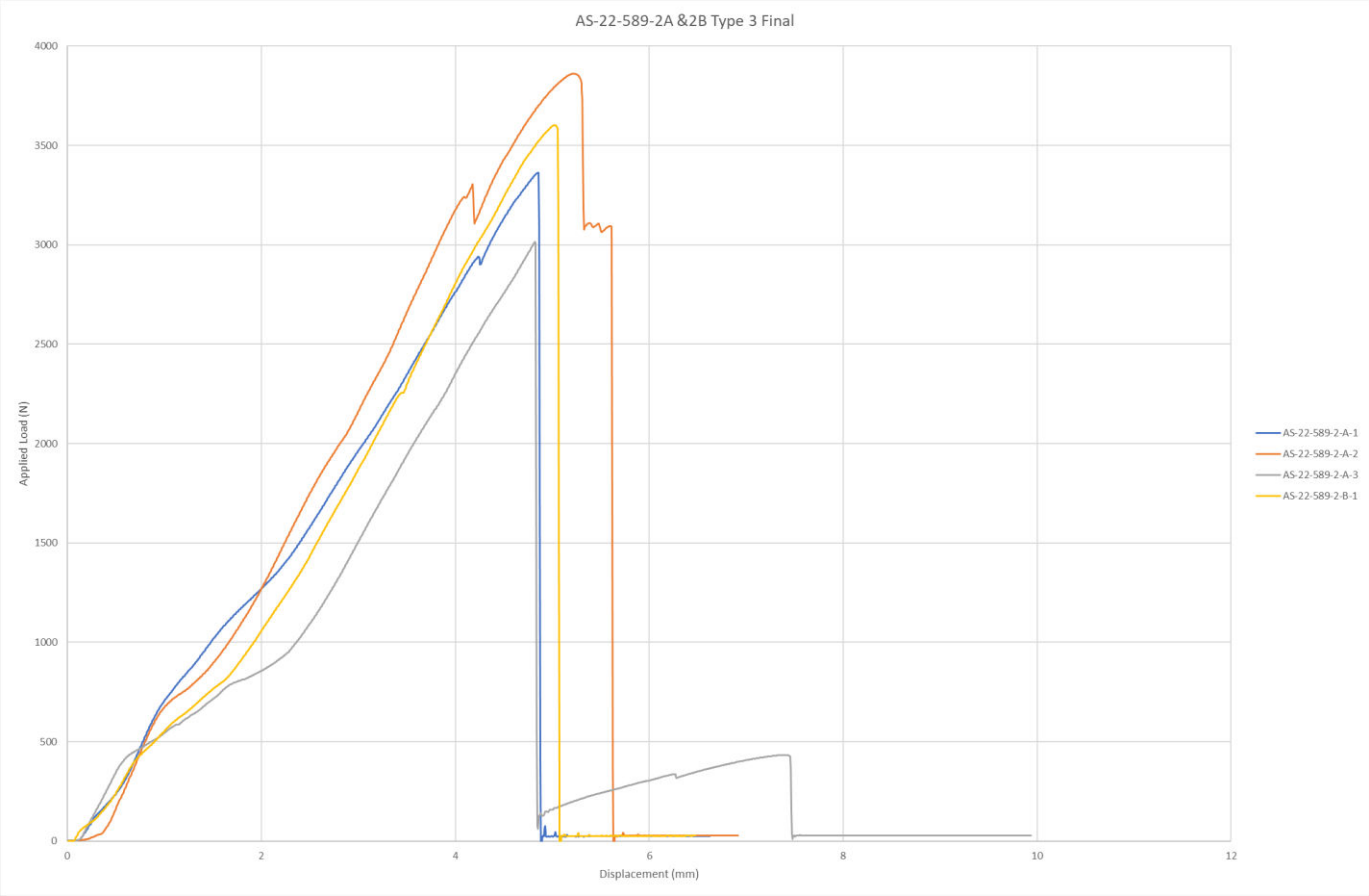

Figure 5.2 Type 3 Shear test

Figure 5.3 Type 2 Shear test images

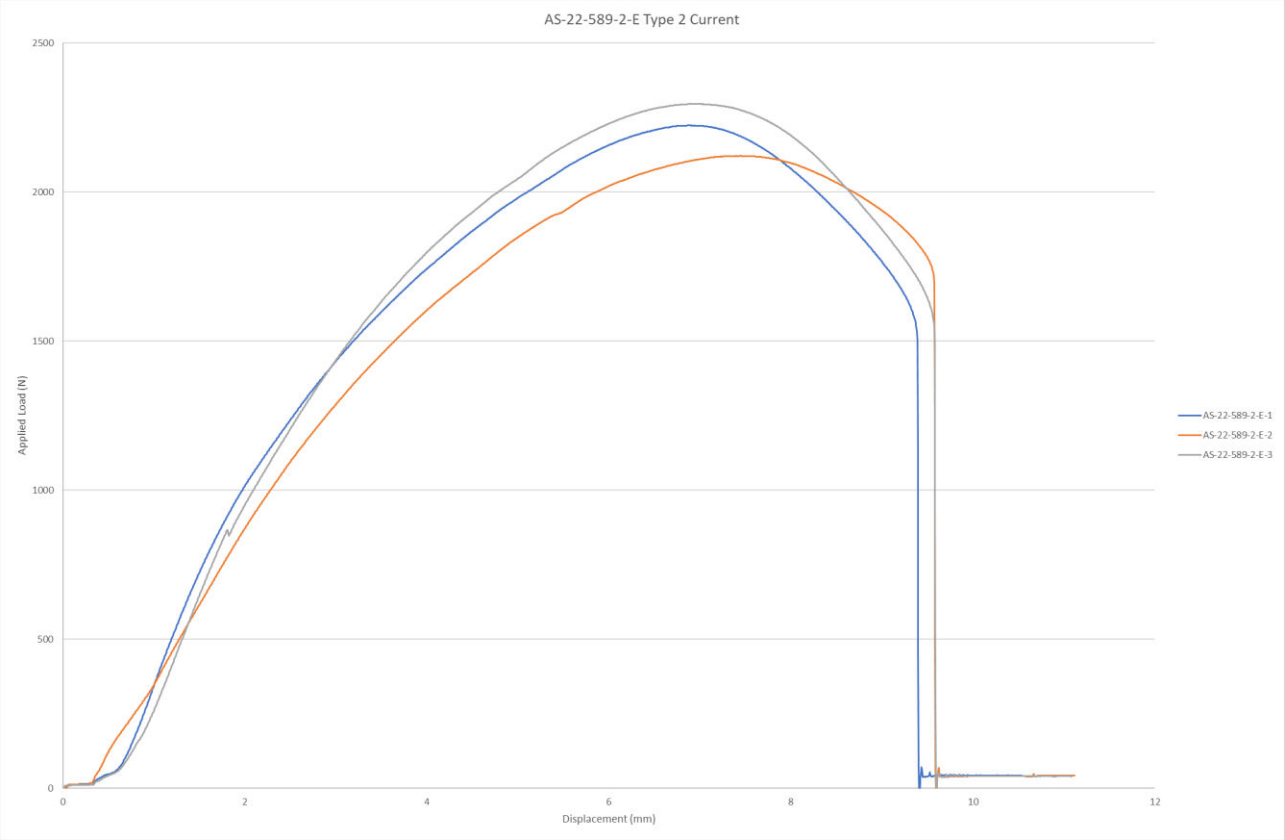

Figure 5.4 Type 2 Shear test

5.2 Test Panel Perpendicular Pull Testing

The perpendicular pull tests were performed on test panels supplied by Buttonfix Ltd, consisting of four (4) buttons and matching sockets attached to the plywood panels. The recorded data for the assemblies is presented in Table 5.2.

Table 5.2: A sample of the recorded data for the perpendicular test assemblies

Specimen Label	Buttonfix Material	Test Type	Maximum Load (N)	Displacement at Max Load (mm)
AS-22-589-2-C-1	Final	Perpendicular Pull	509	1.1
AS-22-589-2-C-2	Final	Perpendicular Pull	909	1.6
AS-22-589-2-C-3	Final	Perpendicular Pull	995	1.4
AS-22-589-2-D-1	Final	Perpendicular Pull	1144	1.8
AS-22-589-2-F-1	Nylon	Perpendicular Pull	314	2.8
AS-22-589-2-F-2	Nylon	Perpendicular Pull	286	2.7
AS-22-589-2-F-3	Nylon	Perpendicular Pull	295	2.4

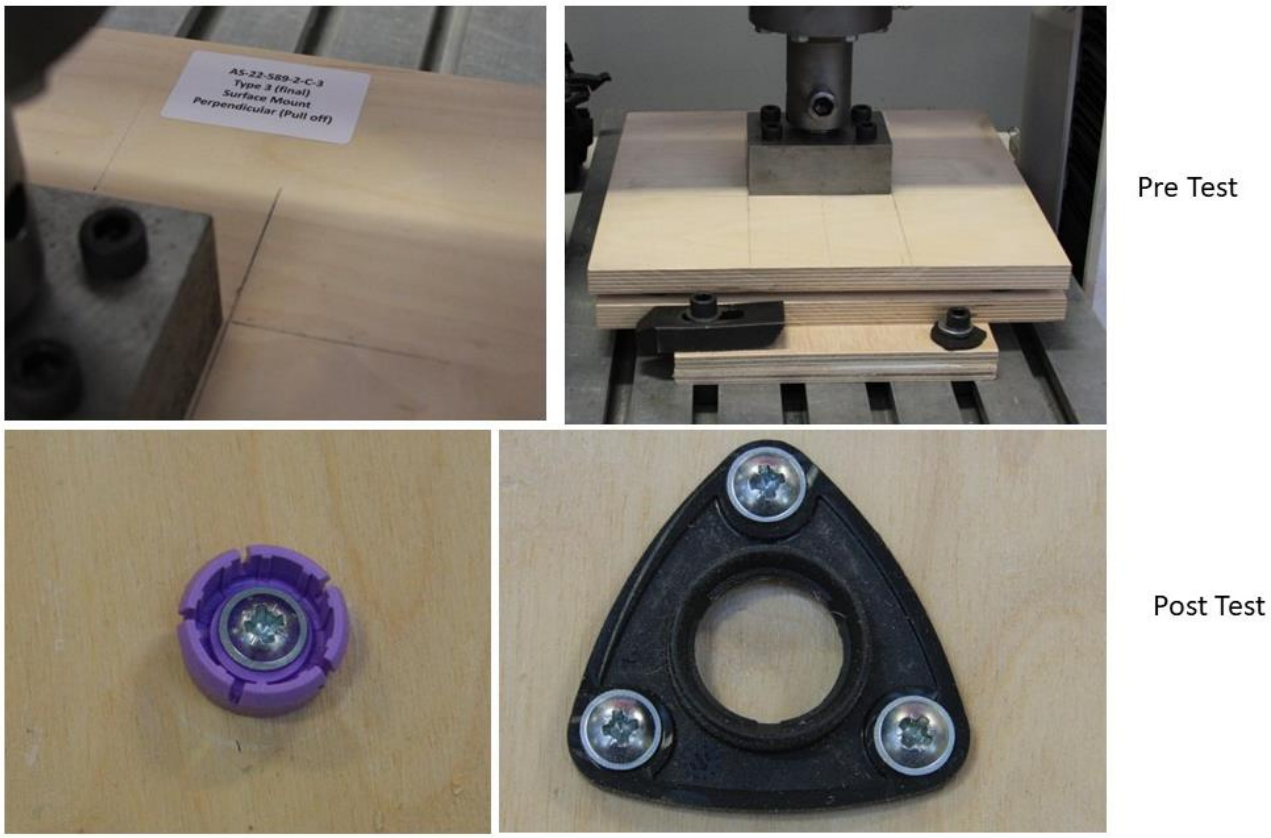

Figure 5.5 Type 3 Perpendicular pull test images

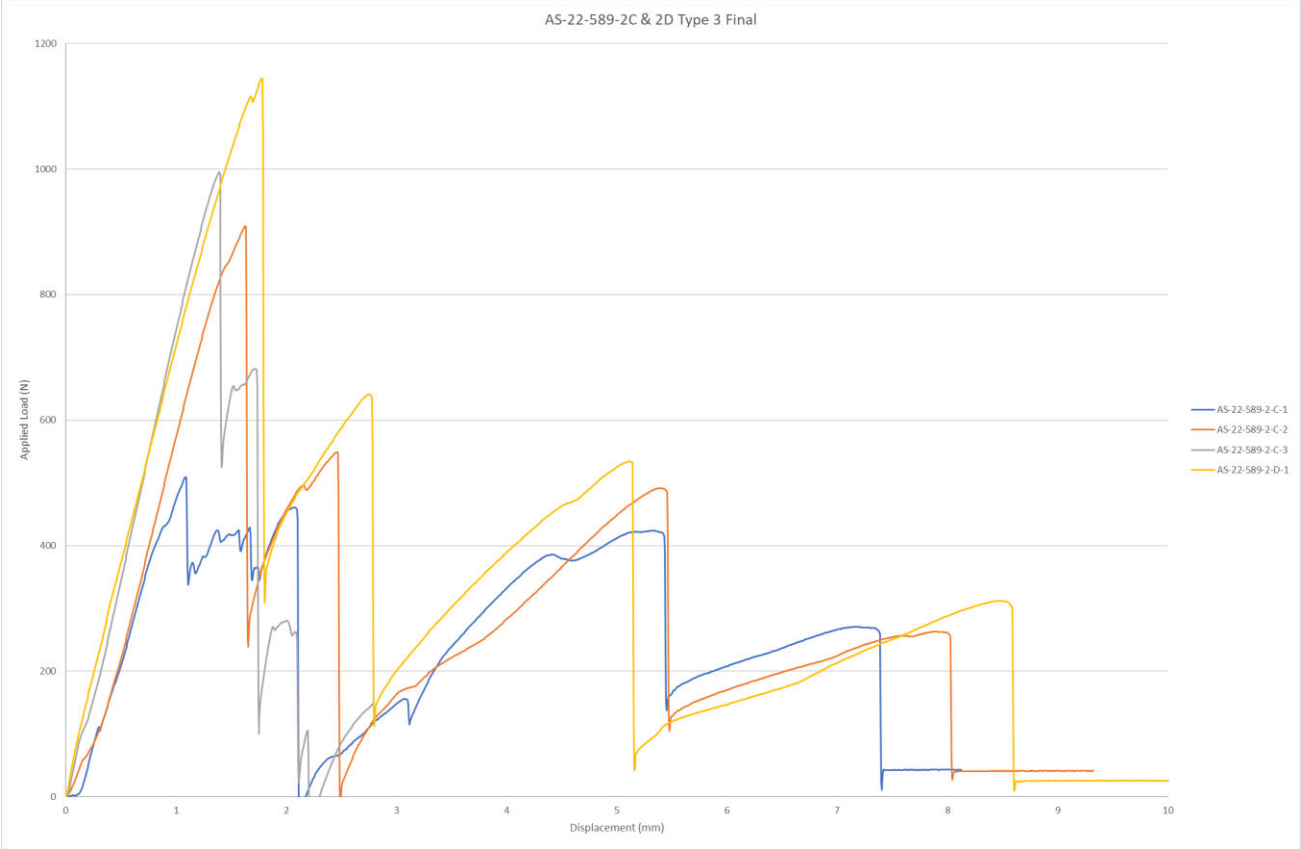

Figure 5.6 Type 3 Perpendicular pull test

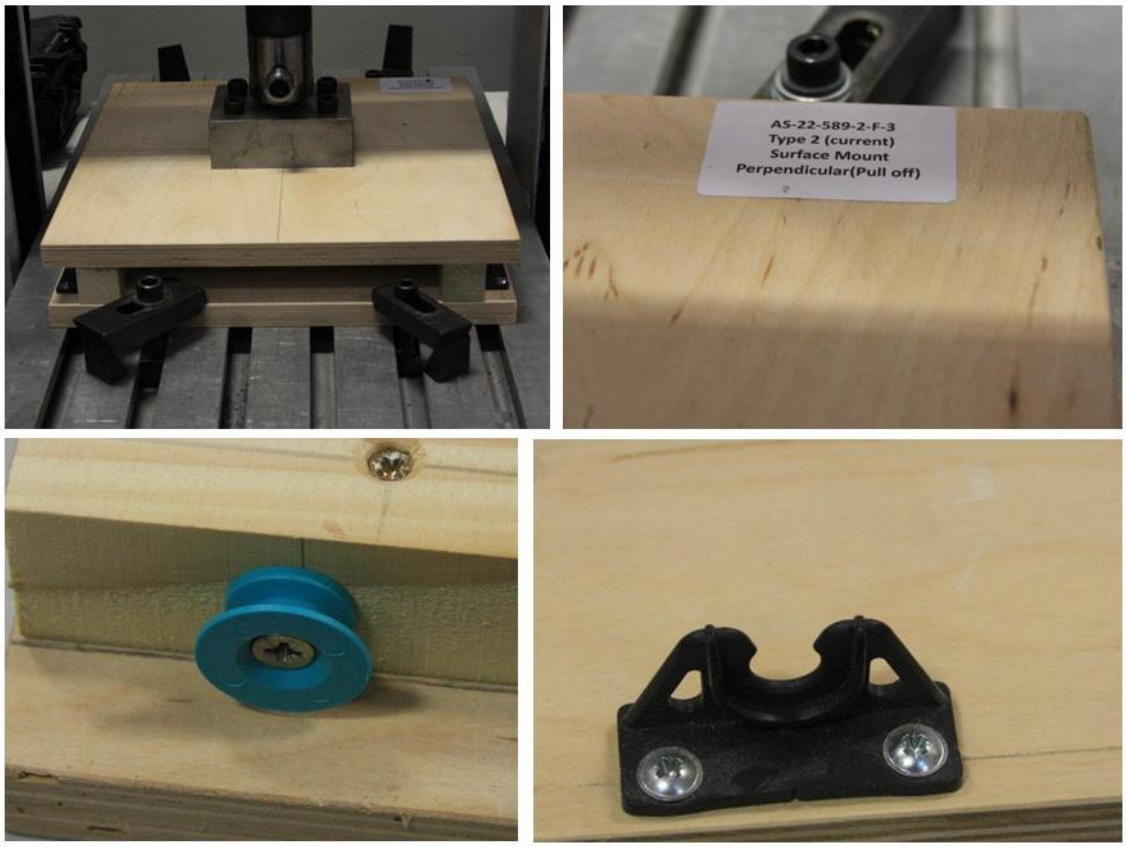

Figure 5.7 Type 2 Perpendicular pull test images

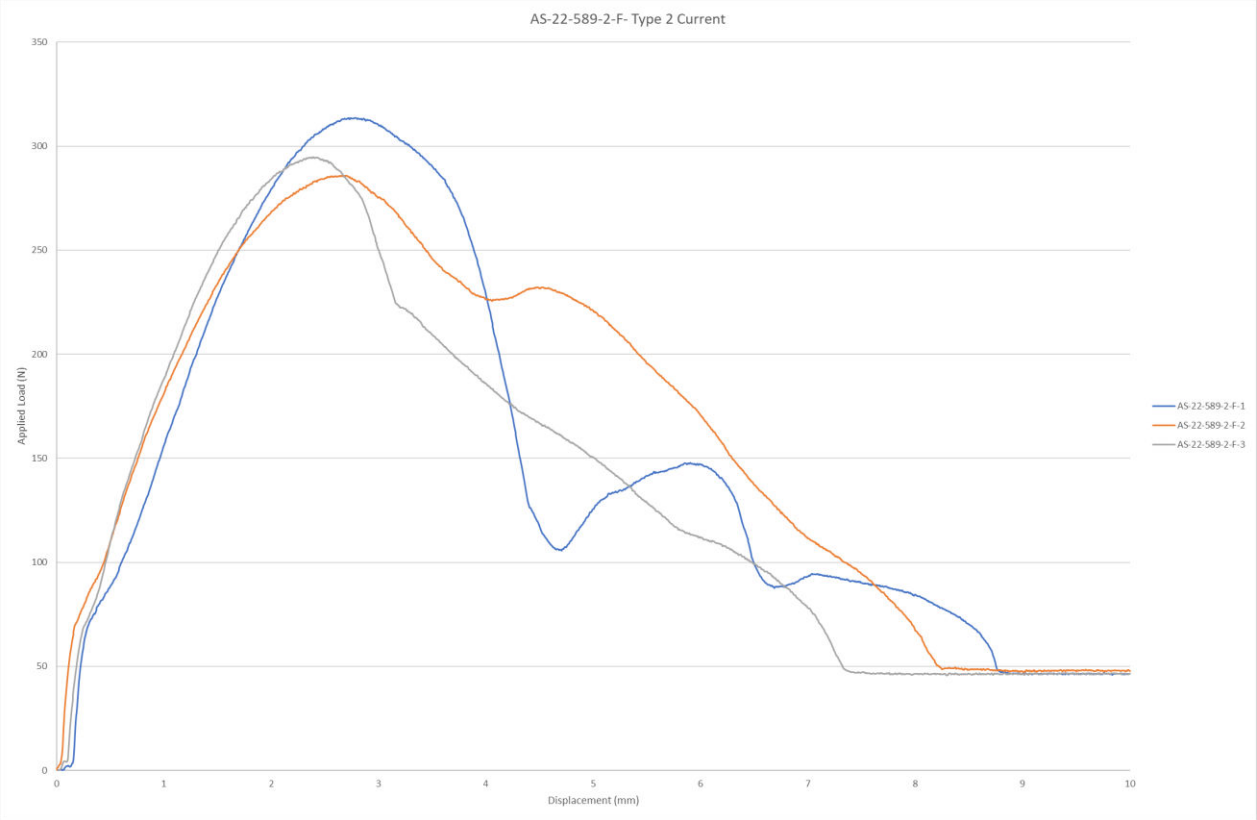

Figure 5.8 Type 2 Perpendicular pull test

6 Conclusion

Testing was conducted in accordance with the requirements of the in-house test procedure TP128[1] as requested by the customer, Buttonfix Ltd. This report presents a sample of the recorded data from the tests carried out.

The tested assemblies are to be returned to Buttonfix Ltd. for further comment and analysis by the customer.

A full series of photographs, test videos and an excel spreadsheet with full data results are contained in the electronic test folder (AS-22-589) that accompanies this report.

The following uncertainty of measurement values have been calculated for the tabulated results:

Applied load +/- 0.56% of reported load.

Displacement +/- 5.28% of reported displacement.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS and the AMRC ASTC ISO/IEC 17025 Flexible Scope of accreditation requirements.

7 References

1. TP128 – AMRC TP128 Button Fix Test Procedure Rev5

8 Appendix 1

0.25mm/sec displacement rate verification.