



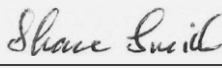
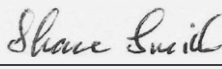

# Buttonfix Fastener Testing

for

Buttonfix Ltd

AS-22-589

12 December 2023

	Name	Signature
Author	Shane Smith	
Technical review (Technical Lead)	Shane Smith	
Authorised (Labs Manager)	Robin Hubbard	
<b>Authorised distribution:</b> Tony Wills, Phil Hall Buttonfix Ltd		
<b>Customer Contact Details:</b> Tony Wills Buttonfix Limited, Unit A, 1 Britton Street, London EC1M 5NW, UK		

Document				Page	
ASTC Test Report				1 of 21	
<b>Document reference</b>	AS-22-589-AMRC-RP-231018A	<b>Status</b>	Released	<b>Revision</b>	02

The University of Sheffield AMRC Structural Testing Centre is a UKAS accredited, Flexible Scope, testing laboratory, No. 4192.

Accreditation covers the development of the test schedule, measurements obtained and the derivative data only.

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



4192

Document				Page	
ASTC Test Report				2 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

The University of Sheffield Advanced Manufacturing Research Centre  
 Knowledge Transfer Centre (KTC)  
 Advanced Manufacturing Research Centre  
 Brunel Way  
 Catcliffe  
 Rotherham  
 S60 5WG  
 United Kingdom

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

The AMRC has exercised due care in conducting this report but has not, apart from as specifically stated, independently verified information provided by others. No other warranty, express or implied, is made in relation to the contents of this report. Therefore, the AMRC assumes no liability for any loss resulting from errors, omissions, or misrepresentations made by others. Any recommendations, opinions or findings stated in this report are based on circumstances and facts as they existed at the time the AMRC performed the work. Any changes in such circumstances and facts upon which this report is based may adversely affect any recommendations, opinions or findings contained in this report. Where experiments have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the statement of work. This work has been undertaken in accordance with the AMRC’s quality system. The results stated within this report relate only to the items tested, calibrated or sampled.

## 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.

Document				Page	
ASTC Test Report				3 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

# Table of contents

- 1 Introduction ..... 5
- 2 Test Equipment ..... 6
- 3 Test Specimens ..... 7
- 4 Test Set Up ..... 9
  - 4.1 Test preparation ..... 9
  - 4.2 Test Requirements ..... 10
  - 4.3 Test Programming and Validation ..... 10
- 5 Test Results ..... 11
  - 5.1 Test Panel Shear Testing ..... 11
  - 5.2 Test Panel Perpendicular Pull Testing ..... 16
- 6 Conclusion ..... 20
- 7 References ..... 21
- 8 Appendix 1 ..... 21

Document				Page	
ASTC Test Report				4 of 21	
<b>Document reference</b>	AS-22-589-AMRC-RP-231018A	<b>Status</b>	Released	<b>Revision</b>	02

# 1 Introduction

This report details the testing undertaken by AMRC Labs on behalf of Buttonfix Ltd between the 9<sup>th</sup> October and the 17<sup>th</sup> 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<sup>1</sup>, 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 3<sup>rd</sup> October 2023.

Document				Page	
ASTC Test Report				5 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

## 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

Document				Page	
ASTC Test Report				6 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

### 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

Document				Page	
ASTC Test Report				7 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

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

Document				Page	
ASTC Test Report				8 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02



## 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<sup>1</sup>.

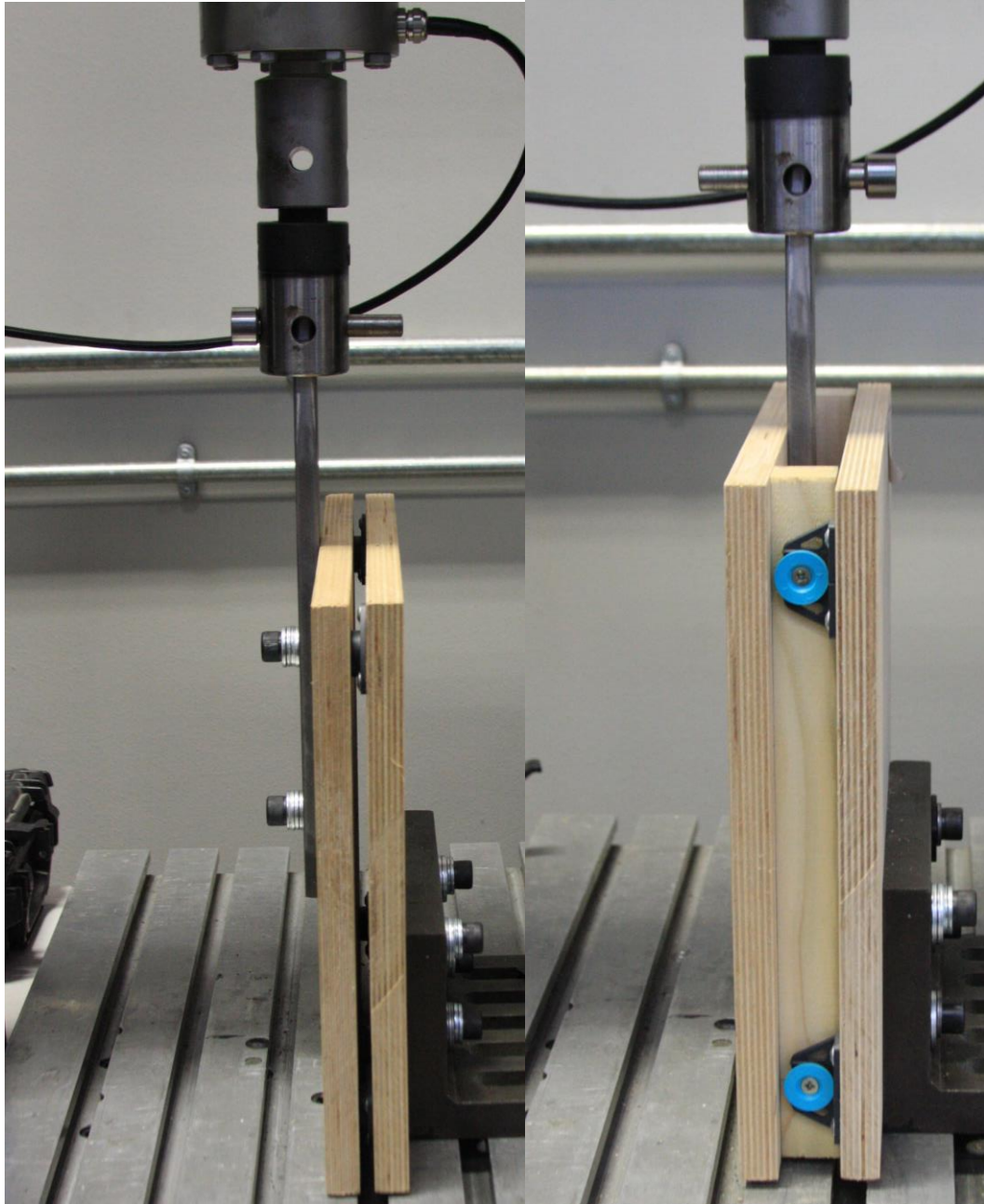


Figure 4.1: Panel Shear Test Setup

Document				Page	
ASTC Test Report				9 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

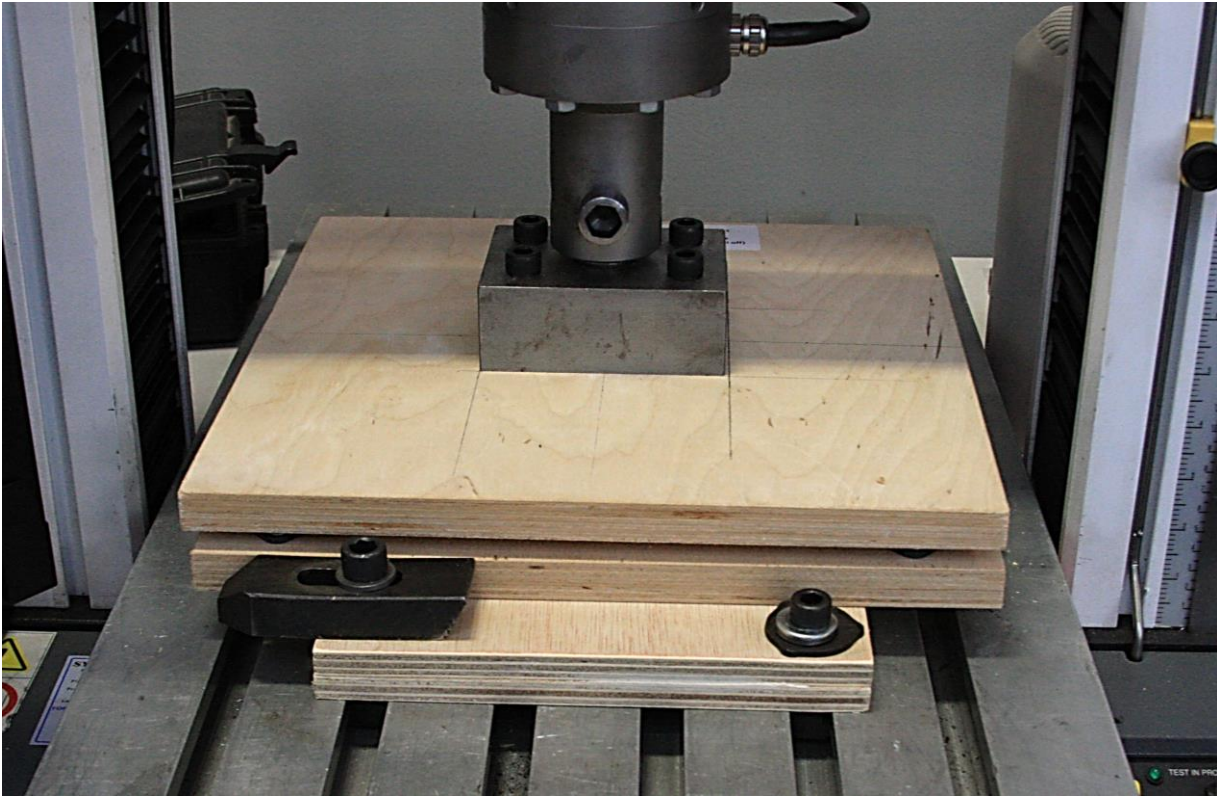


Figure 4.2: Panel Pull Out Test Setup

## 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.

Document				Page	
ASTC Test Report				10 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

## 5 Test Results

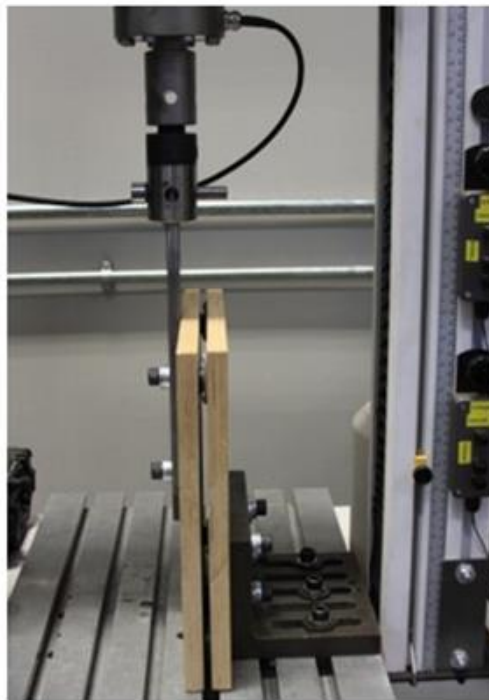
### 5.1 Test Panel Shear Testing

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

Document				Page	
ASTC Test Report				11 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02



Pre Test



Post Test

Figure 5.1 Type 3 Shear test images

Document				Page	
ASTC Test Report				12 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

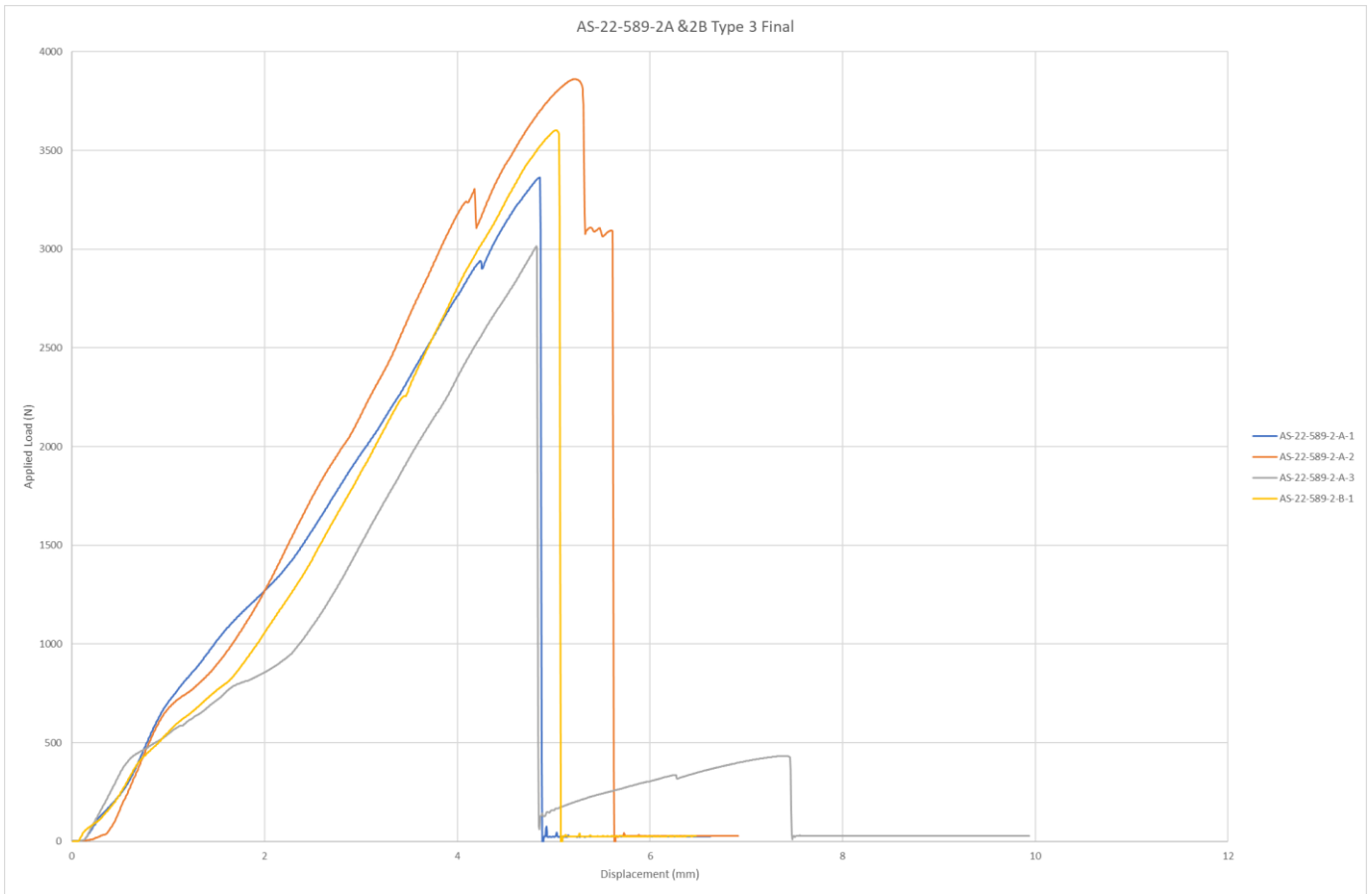


Figure 5.2 Type 3 Shear test

Document				Page	
ASTC Test Report				13 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02



Figure 5.3 Type 2 Shear test images

Document				Page	
ASTC Test Report				14 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

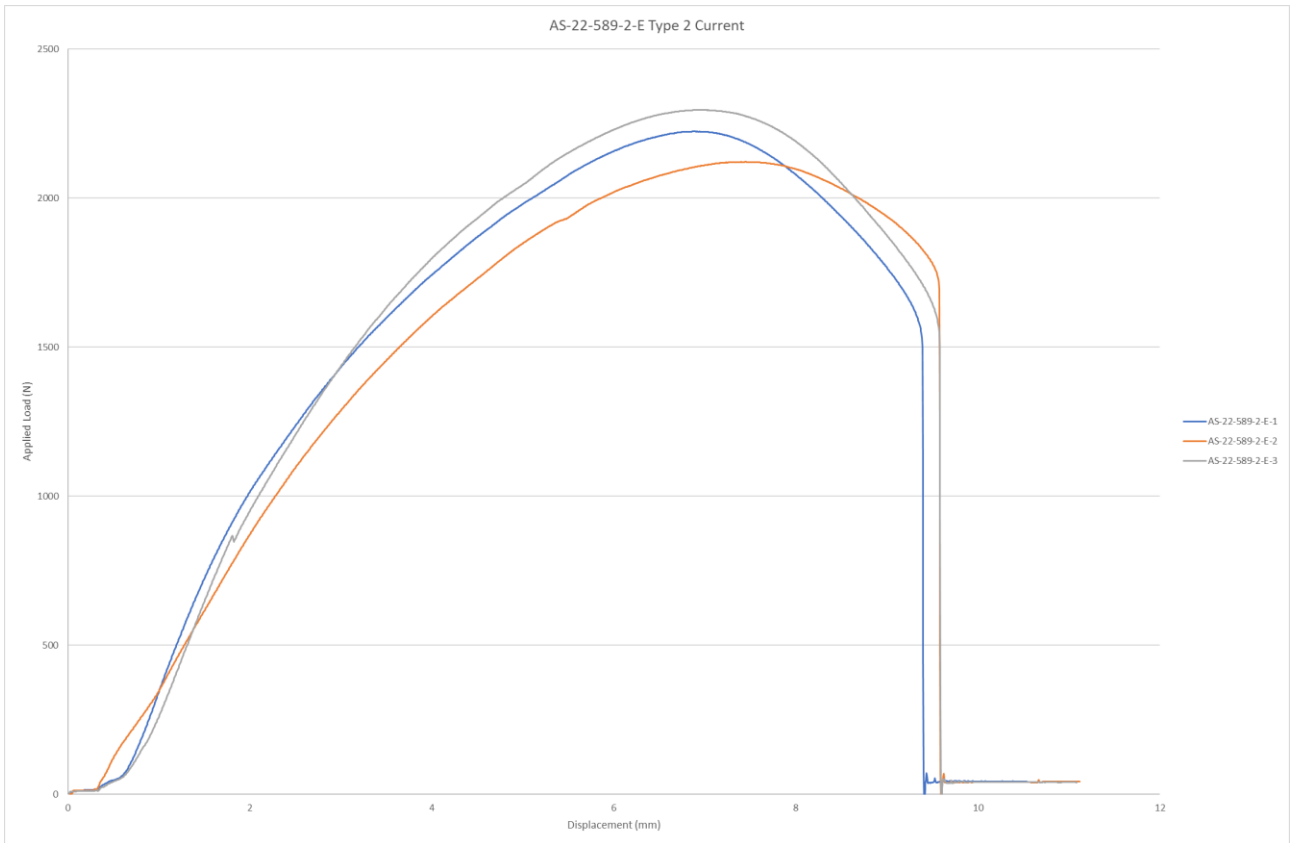


Figure 5.4 Type 2 Shear test

Document				Page	
ASTC Test Report				15 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

## 5.2 Test Panel Perpendicular Pull Testing

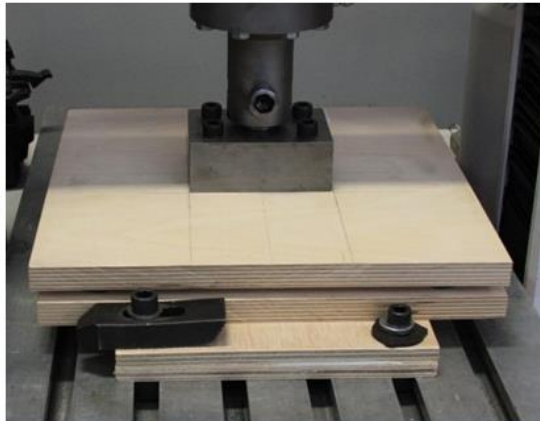
The perpendicular pull tests were performed on test panels supplied by Buttonfix Ltd, consisting of four (4) buttons and matching sockets attached to the plywood panels. The recorded data for the assemblies is presented in Table 5.2.

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

Document				Page	
ASTC Test Report				16 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02





Pre Test



Post Test

Figure 5.5 Type 3 Perpendicular pull test images

Document				Page	
ASTC Test Report				17 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02



Figure 5.6 Type 3 Perpendicular pull test

Document				Page	
ASTC Test Report				18 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

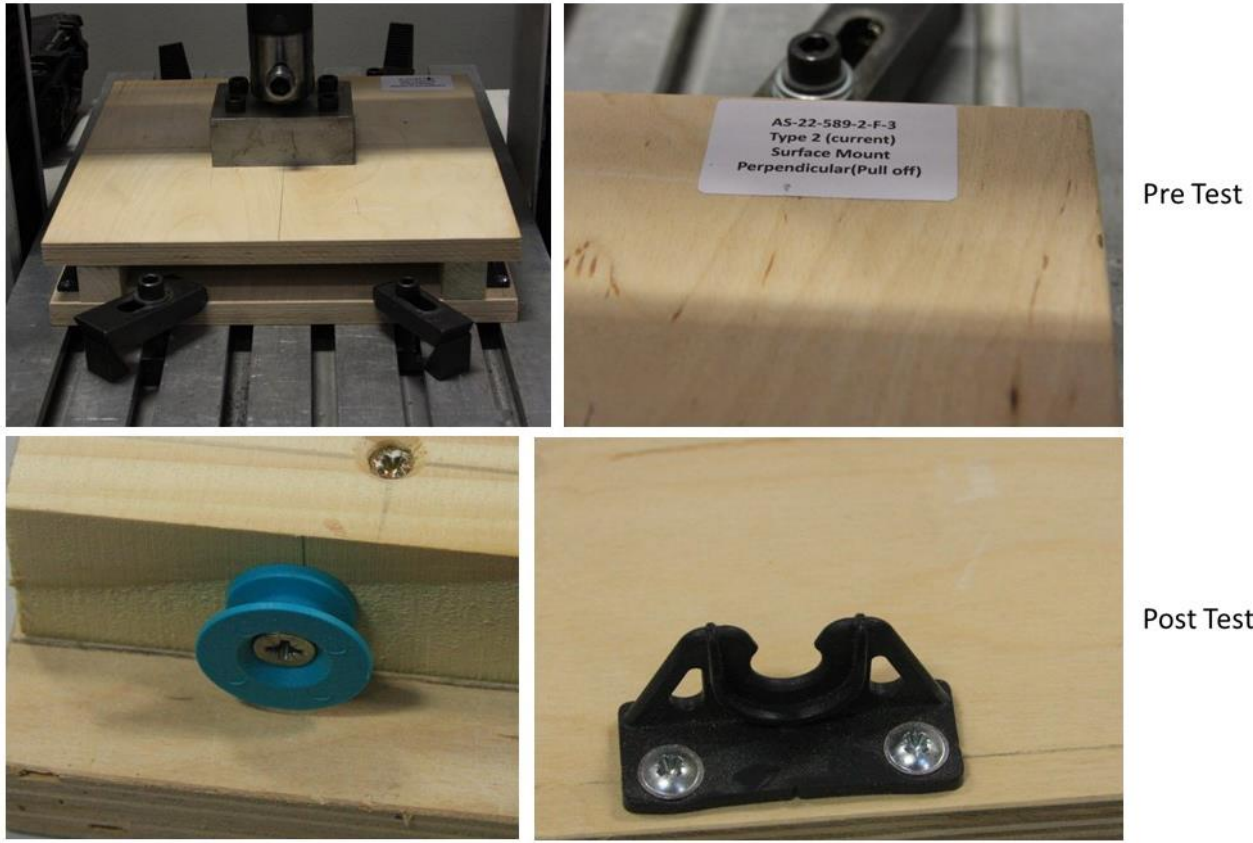


Figure 5.7 Type 2 Perpendicular pull test images

Document				Page	
ASTC Test Report				19 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02

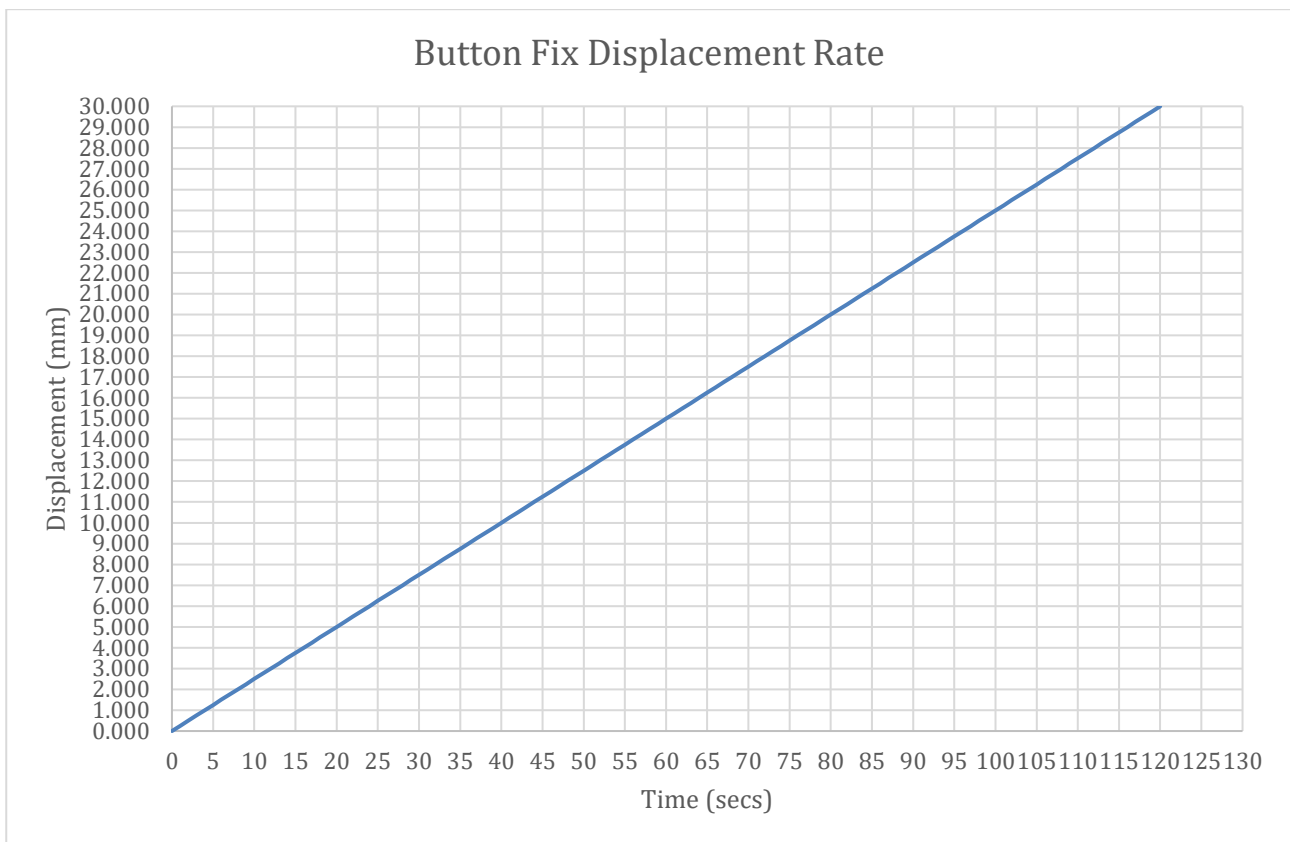


## 7 References

1. TP128 – AMRC TP128 Button Fix Test Procedure Rev5

## 8 Appendix 1

0.25mm/sec displacement rate verification.



Document				Page	
ASTC Test Report				21 of 21	
Document reference	AS-22-589-AMRC-RP-231018A	Status	Released	Revision	02