

Test Report

Report No R14050

Project

**Safe T Punch STP40F Glass breaking device
tested with 6.0mm BS 857/UNECE R43 toughened glass**

Project -14050

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Testing Conducted at: Above address

On behalf of: Safe-T-Punch

Product under test: STP40F – Toughened glass breaking device

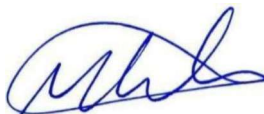
Project No: 14050

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1. INTRODUCTION

Testing was conducted on a new design of Safe T Punch product supplied by ILR Safety CC. The STP40F. The aim of the test was to establish the performance of the STP40F being operated at a range of forces equal to that which can be achieved by hand. 6.0mm thick vehicular glass manufactured in accordance with BS857 were used as test samples for this test. A Steel ball was dropped from varying heights to provide forces of 90N, 100N, 110N, and 120N on the Safe T Punch device fracturing the glass samples, the results were recorded and analysed to further assess the Safe T Punch devices performance and durability.

2. INSTRUMENTATION/TEST EQUIPMENT

2.1 STP40F – Glass breaking devices

These glass breaking devices have been manufactured by ILR Safety CC. The product/device is referred to in this report as the STP40F. These devices are an emergency egress device intended for use in buses, cars, buildings, trains etc. The STP devices intended use is to satisfy the requirement for a "device with which to break readily breakable safety glass" as required by UN ECE R107.

STP40F Low profile Safe T Punch + Safety STRIP

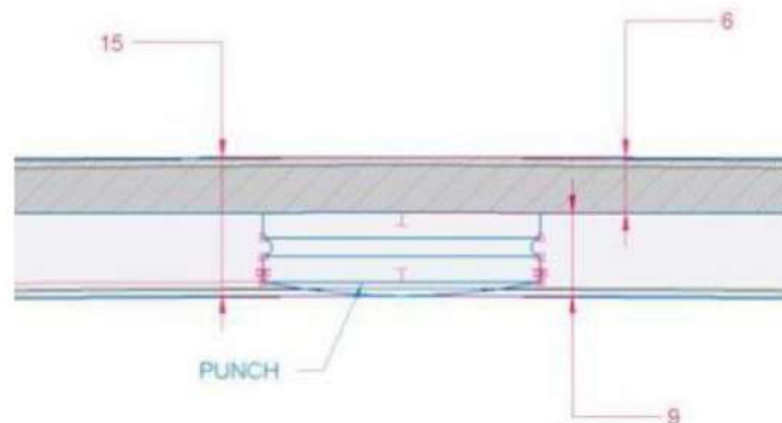
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Manufactured by ILR Safety of Parktown North, Johannesburg, South Africa.

Date 22 March 2014 - (Prop STP40F and STRIP V1.4)

Purpose of proposal:

To fill the need for a low profile Safe T Punch in a roof hatch application on suggestion by Allan Hendrie of Alexander Dennis Limited in line with the below detail drawing.



STP40F features:

Enlarged radius in keeping with ADL's decision to use the STP40N devices.

Larger Strike area to deal with the 6mm glass thickness.

Anodised and engraved aluminium strike surface and drilled recess for a tungsten impact tip as in the STP40N device.

Thick compressible double sided foam tape to fill the need of adhesion and to keep a .5mm clearance between the tip and the glass in normal conditions.

Low profile to minimise injury in roof hatch application.

2.2 Steel ball of mass 1.021 kg and diameter of 63.5mm

A stainless steel ball of mass 1.021 kg was chosen as a suitable means of applying a force to the Safe T Punch devices. The ball is a perfect sphere and therefore would always fall and make identical contact with the Safe T Punch. The steel ball is also similar in weight in to an impactor used in a previous test conducted on a Safe-T-Punch product.

2.3 Load Cells

A calibrated S-Beam load cell was used in order to measure the magnitude of the loads applied by the steel ball and then used to calculate the required drop heights for testing. An average result of 20 forces recorded was then calculated at each drop height to ensure accuracy.

2.4 Glass

The glass samples used for testing have been supplied and manufactured by Independent Glass Co. Ltd. The glass was manufactured in accordance with BS857 Toughened glass for use in land vehicles, including road vehicles and railway vehicles; this is a direct equivalent to glass manufactured in accordance with UNECE R43. 6.0mm thick glass was used for this testing. The glass was clear toughened, 450mm x 450mm square and all supplied from the same batch (Run 71). 5 sheets of glass were checked by Wintech for dimensional accuracy and found to be within the expected tolerances.

2.5 Test Rig

A test rig was designed and made to carry out the required testing. Aluminium profile 80mmx80mm section was used to construct an adjustable 'H' frame. On the centre of the Aluminium frame a centrally mounted section of 120mmx120mm Aluminium profile was used to house the steel ball. This gave a positive location from which the steel ball could be dropped ensuring the ball would fall in a perfect straight line. This technique is commonly used for similar types of glass impact testing. The Glass samples were clamped into a plywood frame with a 6mm compressible gasket (Fig 1 & 2) to ensure the glass was completely secure and could not move during the test. A powered drill with an adjustable torque setting was used to screw the top part of the frame down to ensure a consistent clamping method.

Figure 1



Figure 2



2.6 Equipment Configuration

The test was carried out with the equipment in the configuration shown in Figure 3 and Figure 4. The drop heights used during testing were:

199mm to achieve a force of 90N
233mm to achieve a force of 100N
264mm to achieve a force of 110N
297mm to achieve a force of 120N

Figure 3

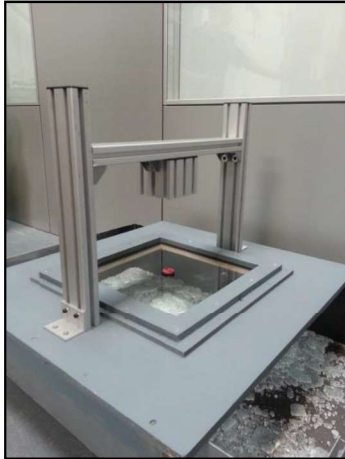


Figure 4



3. TEST PROCEDURE

With the equipment set-up as shown in Figures 1-4 and described above, a load was applied to the STP40F by means of releasing the steel ball at drop heights of 199mm, 233mm, 264mm and 297mm on the 6mm thick glass samples. If the glass did not break on the first impact the test was repeated until breakage occurred. A total of 28 tests were carried out with the STP40F

The testing was carried out in laboratory conditions at 21.5°C and 52% Relative humidity.

A visual check of the Safe T Punch devices was conducted throughout the testing to check for any signs of damage or wear.

Note – The drop heights for all tests were measured from the top of the STP device to the bottom of the steel balls hold and release section of 120mmx120mm Aluminium profile.

4. TEST RESULTS STP40F

Tested on 6.0mm BS 857 glass samples

STP id number – 90N

90N of force (199mm drop height)

Test No	Impacts until breakage
Test 1	1
Test 2	1
Test 3	1
Test 4	2
Test 5	1
Test 6	1
Test 7	2

STP id number – 100N

100N of force (233mm drop height)

Test No	Impacts until breakage
Test 8	1
Test 9	1
Test 10	1
Test 11	1
Test 12	2
Test 13	1
Test 14	1

STP id number – 110N

110N of force (264mm drop height)

Test No	Impacts until breakage
Test 43	1
Test 44	1
Test 45	2
Test 46	1
Test 47	2
Test 48	1
Test 49	1

STP id number – 120N

120N of force (297mm drop height)

Test No	Impacts until breakage
Test 50	1
Test 51	1
Test 52	1
Test 53	3
Test 54	1
Test 55	1
Test 56	1

Note – All of the STP devices used for testing have been marked with individual ID numbers on the underneath of the device and will be returned to ILR Safety CC for any further analysis they may wish to carry out.

5. CONCLUSION AND OBSERVATIONS

During the test, all samples of STP40F performed correctly and safely and all sheets of glass were broken with a maximum of 3 impacts regardless of the force used. After completion of testing the following observations were made:

- The STP40F qualifies as a "device" for the purpose of breaking toughened safety glass.
- The STP40F meets the criteria extracted from clause 7.6.9.5 from UN ECE R 107 *"In the case of a readily-breakable hatch, a device shall be provided adjacent to the hatch, readily available to persons inside the vehicle, to ensure that the hatch can be broken"*
- The STP40F devices are very reliable in terms of performance and mechanical durability.
- The impacts tips of the STP devices showed no signs of wear through the testing.
- The STP40F worked very effectively at the range of forces used for this testing project.
- It was not critical that the STP40F device was adhered to glass for this method of testing due to the design of the test rig.
- Multiple uses of the STP40F device do not affect its performance and ability to break the glass.

Below is a breakdown of each set of results with the performance analysed.

STP40F tested with 6.0mm BS 857 glass

90N of force

- Maximum number of impacts to break glass – 2
- Minimum number of impacts to break glass – 1
- Average number of impacts to break glass – 1.28
- Percent of breaks on 1st impact – 71.4%

100N of force

- Maximum number of impacts to break glass – 2
- Minimum number of impacts to break glass – 1
- Average number of impacts to break glass – 1.14
- Percent of breaks on 1st impact – 85.7%

110N of force

- Maximum number of impacts to break glass – 2
- Minimum number of impacts to break glass – 1
- Average number of impacts to break glass – 1.28
- Percent of breaks on 1st impact – 71.4%

120N of force

- Maximum number of impacts to break glass – 3
- Minimum number of impacts to break glass – 1
- Average number of impacts to break glass – 1.28
- Percent of breaks on 1st impact – 85.7%

Overall performance of ST40F over the 28 tests carried out

- Total number of impacts required to break all 28 sheets of glass – 35
- Number of sheets of glass broken on 1st impact -22
- Maximum number of impacts to break glass – 3
- Average number of impacts to break glass – 1.25
- Percent of breaks of glass on 1st impact – 78.5%
- Percent of breaks of glass on 2nd impact – 17.9%
- Percent of breaks of glass on 3rd impact – 3.6%

6. FURTHER SUGGESTIONS

It may be worthwhile testing the STP40F devices in accordance with the previous test method at Wintech 'R13893' with glass samples of 4mm and 5mm thickness to ensure/compare performance characteristics of the STP40F devices with the STP40N to evaluate if they are the same or even improved. It would also be worth considering re-testing the STP40F devices on further samples of BS857 glass of 6mm thickness at a higher force of 150N to conclusively prove the 100% break 1st time force required.

----- END OF REPORT -----