HOLMESSOLUTIONS

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Prepared for Humpty's Fall Breaker Ltd

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Roof Safety Mesh Testing

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15. Supplementary Notes

This report summarises the findings of testing completed on the performance of Humpty's Fall Breaker membrane safety mesh. The material was supplied and subjected to dynamic loadings in accordance with AS/NZS 4389:1996. The specimens were deemed to meet the requirements of AS/NZS 4389:1996, and additional testing as requested by the client.

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1 SUMMARY

Humpty's Fall Breaker Ltd has developed a new product to be used as a safety mesh for use in the construction industry. A testing programme has previously been completed on an alternative product; a new supplier of material has facilitated the need to validate further testing to demonstrate on going compliance with AS/NZS 4389:1996. A summary of the results from this later testing programme is shown in Table 1.

Table 1 – Summary of test results for testing as per AS/NZS 4389:1996

Purlin construction	Dynamic loading [kJ]	Result
Timber test 1	2.5	Passed
Timber test 2	2.5	Passed
Steel test 1	2.5	Passed
Steel test 2	2.5	Passed

An additional series of tests were completed in accordance with test setup requested by the client. This testing used identical impact conditions as AS/NZS 4389:1996, but an alternative setup and fastening technique. The results from this testing are shown in Table 2.

Table 2 – Summary of test results for testing as per client setup

Purlin construction	Dynamic loading [kJ]	Result
Client setup test 1	2.5	Passed
Client setup test 2	2.5	Passed
500mm Overlap test	2.5	Passed

2 INTRODUCTION

2.1 Background

Humpty's Fall Breaker Ltd have developed a safety mesh – Humpty's Fall Breaker membrane, for use in the construction industry, the mesh is used to prevent injury from falls by being placed on top of purlins, rafters or other such members when workers are required to work at elevated heights. The mesh is designed to be attached in-situ at the place of construction.

Testing was in accordance with AS/NZS 4389:1996 Standard. Figure 1 shows a typical installation arrangement. Additional test setup is shown in Figure 2.

The testing was completed at the Holmes Solutions testing laboratory, located in Hornby, Christchurch.

Figure 1 –Installation detail as per AS/NZS 4389:1996

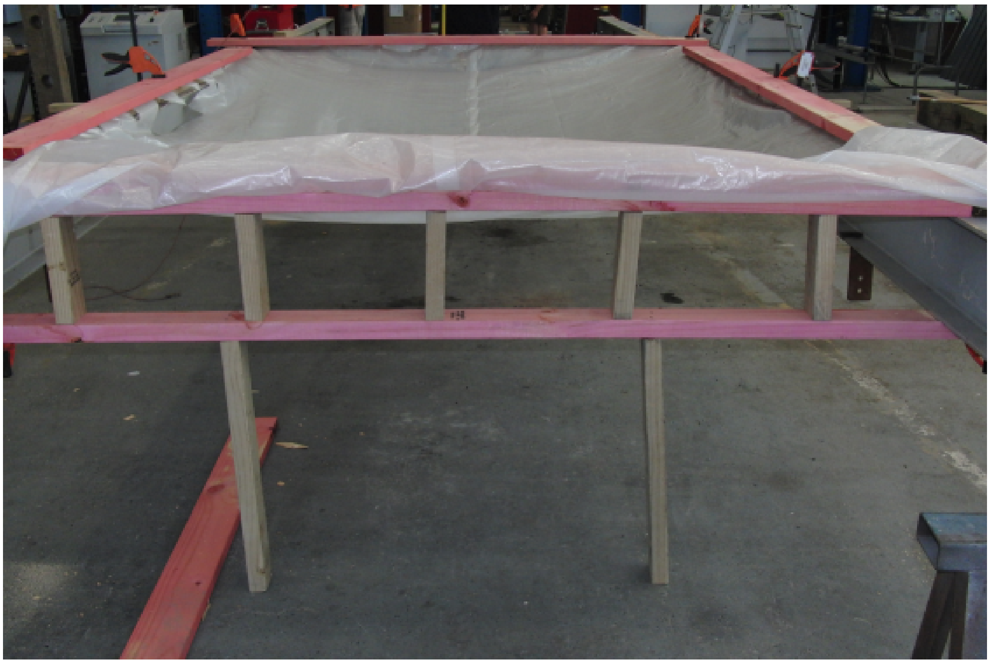

Figure 2 – Additional test setup as per client instructions

3 TEST ARTICLES

The specimen supplied consisted of 4 test sheets, approximate sizes were 5.0 x 2.5m, the sheets had a welded lap seam that ran perpendicular to the structural support members. Figure 3 shows the sample supplied for testing.

Figure 3 – Typical sample of safety mesh sheeting

Added to all test sheets was an Ø50mm hole in the centre of the test sheets to act as a drainage hole. Figure 4 shows a typical hole in safety mesh.

Figure 4 – Typical hole in safety mesh sheeting

4 TEST HARDWARE

As per the Standard, the test load shall consist of a sand bad approximately 1500mm long by 350mm diameter which weighed 165 kg. Figure 5 shows the test load used for testing.

Testing is completed by dropping the test weight, in a horizontal orientation onto the mid-span of the membrane from a free fall height of 1400 mm.

Figure 5 – Test load for inducing dynamic load

5 INSTRUMENTATION AND DATA ACQUISITION

All testing was captured with CASIO Exilim HS cameras at 300 frames per second and later analysed using Redlake reticle facility.

6 TEST SETUP

As per the AS/NZS 4389:1996, purlins were placed at 1500mm centres with a span of 2000mm. The purlins were attached to steel plates welded to a 200mm I-beam section. The safety mesh was placed over the purlins and attached at either end only.

The timber purlins were 200x50mm Grade F5 timber, the Steel purlins were C150x1.75mm G550 Steel. All material was purchased from local building merchant(s).

The proposed attachment method was to wrap the over hanging material around a 50x25mm timber batten, the batten was attached to the side of the purling at 200mm centre's with screws when installed on a timber purlin and 200mm centres when installed with a steel purlin. Figure 6 shows detail of the connection end. In accordance with AS/NZS 4389:1996, no side attachment of the membrane was utalised.

Testing was completed by holding the test load in a horizontal position and released to land in the in the centre of the test setup, with lowest point of the test load a minimum of 1400mm from the safety mesh. A mechanical quick release mechanism was used to ensure a rapid release of the test load from the desired height.

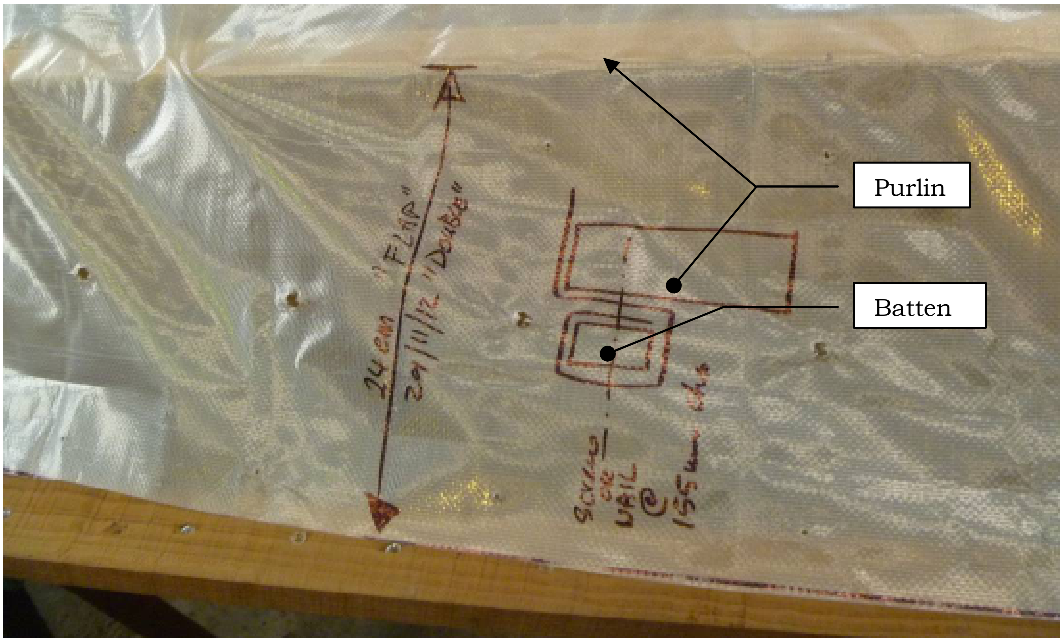

Figure 6 – Unwrapped section of safety mesh at connection end

7 DYNAMIC LOAD TEST RESULTS

A series of tests were performed as per the Standard, two tests were performed with timber purlins and two with steel purlins.

The following images show the results of the individual tests.

Figure 7 – Timber purlin test 1 results

Figure 8 – Timber purlin test 2 results

Figure 9 – Steel purlin test 1 results

Figure 10 – Steel purlin test 2 results

8 ADDITIONAL ATTACHMENT DETAIL TESTING

To complement the testing as per the Standard, an alternative test arrangement was investigated, replicating the intended use of the material in a domestic construction process. The purpose was to validate that an alternative fixing detail could be used and achieve a suitable outcome when subjected to identical impact force as detailed in AS/NZS 4389:1996, as the test setup differed from that specified in the Standard, the testing was also deemed to be non-standard.

8.1 Alternative attachment details

The proposed alternative attachment details are designed around a typical house construction. The support frame consisted of a 90x45mm Laser frame constructed in a 4x3m layout. The safety mesh was draped over the laser frame and restrained via truss packer timber (140x35mm). The safety mesh was installed with a minimum of 300mm overhang on all edges. The truss packer is attached to the laser frame via a nail gun, 2 nails attached at 300mm centre's, the nails are applied in a diagonal pattern, at 45°, see Figure 11.

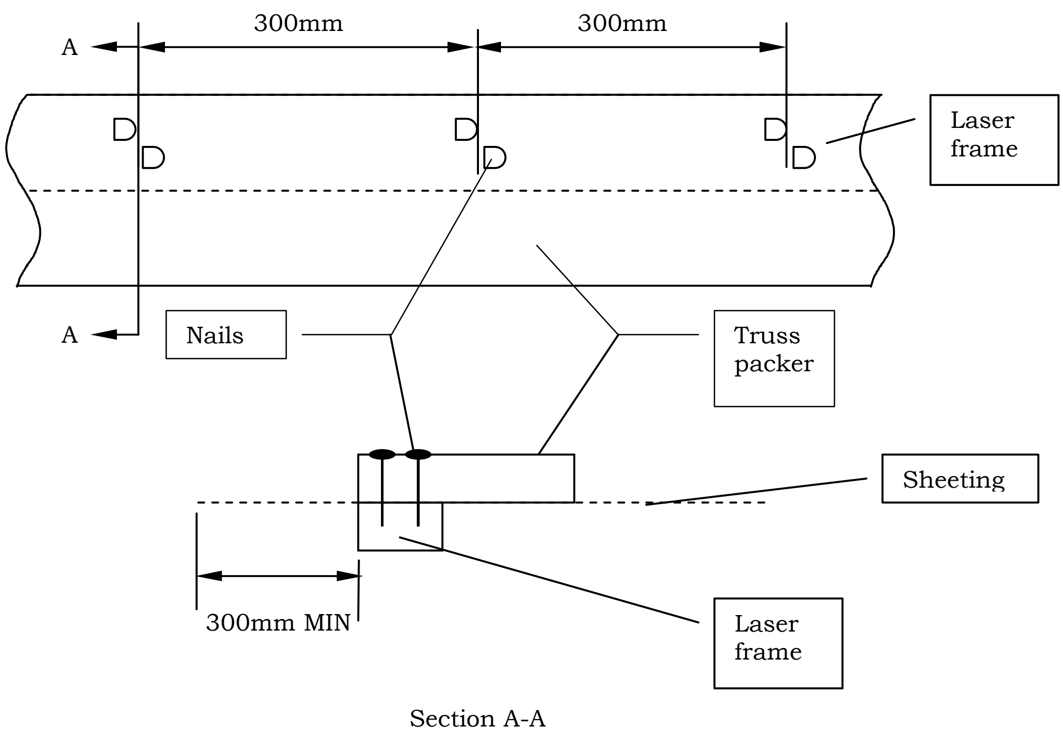

Figure 11 – Alternative attachment details

8.2 Testing Procedure

Testing was completed by raising the test weight to a minimum height of 1.4m. The test weight was released via a quick release mechanism to impart the same impact forces as per the Standard AS/NZS 4389:1996. Two drop tests were performed; each was recorded with a high speed camera.

8.2.1 OVERLAP TEST

Additional to the drop test, was an overlap test, two separate sheets of safety mesh were overlapped by 500mm, the object of the exercise was to confirm that the test weight would not penetrate the overlapped mesh sheets. The testing procedure was identical to previous testing. Figure 12 shows the overlap test setup.

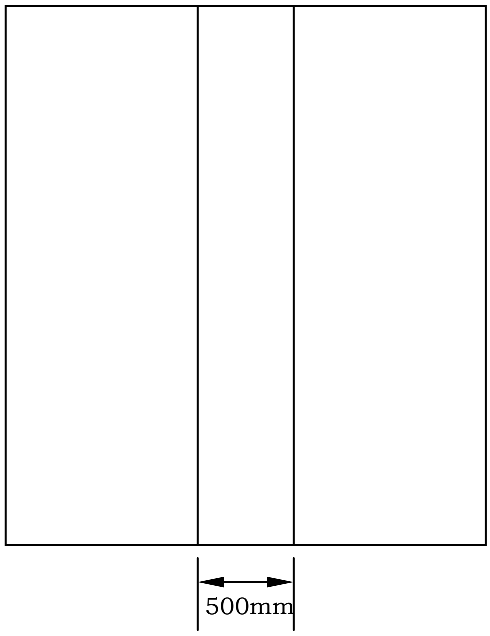

Figure 12 – Overlap test setup

8.3 Test Results

The test results based on this testing showed that the alternative attachment methods withstood the drop test. Figure 13 shows the alternative attachment method after the initial drop test. The overlap test results showed that a 500mm overlap supported the test load without the test weight penetrating the test sheets.

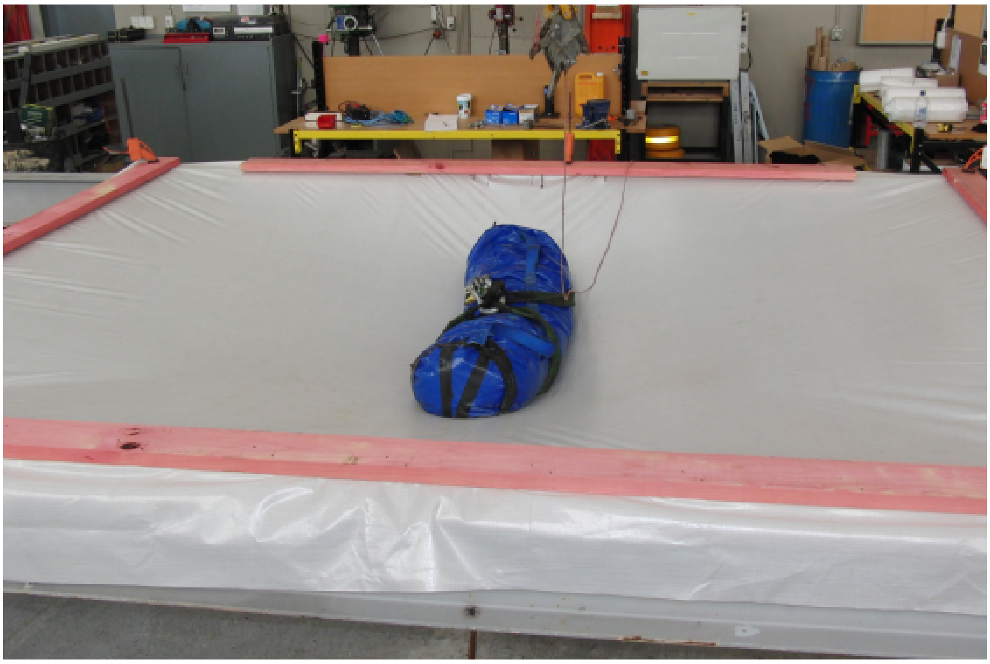

Figure 13 – Drop test result with alternative attachment method