TEST REPORT

REPORT NUMBER: 102050611TOR-002
ORIGINAL ISSUE DATE: April 30, 2015

EVALUATION CENTER

Intertek Testing Services Ltd.
6225 Kenway Drive
Mississauga, Ontario L5T 2L3

RENDERED TO

Safe-T-Strap
1885-209 Clements Road
Pickering, ON L1W 3V4

PRODUCT EVALUATED
Temporary Anchorage Connector

EVALUATION PROPERTY
Dynamic Performance Testing

Report of Testing Temporary Anchorage Connectors for Dynamic Performance Testing in accordance with ANSI/ASSE Z359.1.

1 Table of Contents

2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted dynamic performance testing for Safe-T-Strap at their manufacturing location on temporary anchorage connectors conducted in accordance with Section 4.3.3.2 of ANSI/ASSE Z359.1. This evaluation began on April 29, 2015 and was completed on April 30, 2015.

3 Test Specimen

3.1. SPECIMEN SELECTION

Samples were submitted to Intertek directly from the client in new and unused condition. Samples were not independently selected for testing. Samples of both Nylon and Polyester anchor straps were received at the Intertek Mississauga Evaluation Center.

The Safe-T-Straps tested were constructed of nominal 2" (51mm) wide, 1/16" (1.6mm) thick material (nylon or polyester) with an overall length of 28" (711mm) and rated for 5000 lb (2268 kg) capacity. One end of the strap was fitted with a 3/8" thick, 2 5/8" x 3" (67mm x 75mm) D-Ring which was retained within the strap by a stitched loop formed by the webbing. This loop was overlapped once. The overlap measured 4 ¼" (108mm) and was stitched by a "double zigzag (2WW)" stitch pattern measuring 2 ¼" x 1 ½" (57mm x 38mm) overall. The other end consisted of 2 'wings' which were used to attach the strap to the roof peak. These ends consisted of one overlap of webbing per side measuring 8 ¼" (210mm). These ends were sewn together using a "double zigzag (2WW)" stitch pattern measuring 7 ¼" x 1 ½" (184mm x 38mm).

3.2. ASSEMBLY DESCRIPTION

A mock-up roof deck, measuring approximately 3ft (914mm) long by 2ft (610mm) wide was constructed by Safe-T-Strap personnel and provided to Intertek for testing purposes. The roof deck was constructed following approved building methods for timber-frame construction. The roof deck consisted of 6 truss sections made from 2x6 SPF lumber, connected together with a ridge joist and covered with 3/8" SPF sheathing.

The roof deck was securely attached to a structural steel frame constructed to meet the requirements outlined within ANSI/ASSE Z359.1. An engineering report regarding the vibration response of the frame can be found in Appendix B of this report.

Eight (8) temporary anchors were secured over the ridge of the roof deck with 6 fasteners on each side of the strap. Each fastener was placed between the cross-stitching areas of each end of the strap.

Details of the strap assemblies are as follows: (on next page)

Sample #	Strap Material	Environmental Conditioning	Loading Direction	Fastener Type
1	Nylon (Yellow)	-30°C for at least 48 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail
2	Nylon (Yellow)	Ambient	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail
3	Nylon (Yellow)	Ambient	Parallel to ridge (off the side)	3 ¼" Ardox nail
4	Nylon (Yellow)	54°C & 85% RH for at least 2 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail
5	Polyester (White)	-30°C for at least 48 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail
6	Polyester (White)	Ambient	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail
7	Polyester (White)	Ambient	Parallel to ridge (off the side)	3 ¼" Ardox nail
8	Polyester (White)	54°C & 85% RH for at least 2 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail

4 Testing and Evaluation Methods

4.1. SPECIMEN PREPARATION & CONDITIONING

Two (2) anchor straps (1 of each material) were placed into a freezer at -30°C for a minimum of 48 hours prior to testing. At the time of testing, the samples were removed from the freezer and were allowed to return to room temperature before testing commenced. Two (2) anchor straps (1 of each material) were placed into an oven at 50°C for a minimum of 48 hours prior to testing. At the time of testing, the samples were removed from the oven and were allowed to return to room temperature before testing commenced. The remaining four (4) samples were kept at ambient lab conditions prior to and during the testing period.

All samples were installed onto the mock-up roof deck by qualified Safe-T-Strap personnel using the fasteners and locations as described above.

4.2. DYNAMIC PERFORMANCE TESTING

Testing was performed in accordance with Section 4.3.3.2 of ANSI/ASSE Z395.1-1992(R1999). Each of the 6 temporary anchors were attached to the roof deck by qualified Safe-T-Strap personnel, using the appropriate fasteners (as noted above). The fasteners are required to be located within the cross-stitched area on each end of the strap and are also required to be fastened into the roof truss. After the straps were installed, a 6ft (1829mm) long, 3/8" diameter, Type 302 Stainless Steel aircraft cable was attached to the D-Ring on the strap via a 6000lb capacity shackle. The other end of the steel cable was attached to a dynamic load cell via a 6000lb capacity shackle. Finally, a 220lb (100kg) steel load was attached inline to the other end of the load cell. This assembly was then connected to a temporary support with a quick release mechanism. The load was raised the required 6ft distance and dropped. Visual observations were then made and impact loads were recorded. Static strength testing was not evaluated as part of this test program.

5 Testing and Evaluation Results

Table 1. Safe-T-Strap Dynamic Performance Testing Results							
Sample #	**Strap Material**	**Environmental Conditioning**	**Loading Direction**	**Fastener Type**	**Impact Force (lbf)**	**Loadcell Impact Weight (lbf)**	**Comments**
1	Nylon (Yellow)	-30°C for at least 48 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail	5012	330	No disengagement of nails
2	Nylon (Yellow)	Ambient	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail	5012	345	No disengagement of nails
3	Nylon (Yellow)	Ambient	Parallel to ridge (off the side)	3 ¼" Ardox nail	5012	363	Minimal disengagement of 2 nails – strap withheld load
4	Nylon (Yellow)	54°C & 85% RH for at least 2 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail	5012	355	No disengagement of nails
5	Polyester (White)	-30°C for at least 48 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail	5012	341	No disengagement of nails
6	Polyester (White)	Ambient	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail	5012	374	No disengagement of nails
7	Polyester (White)	Ambient	Parallel to ridge (off the side)	3 ¼" Ardox nail	5012	362	Minimal disengagement of 2 nails – strap withheld load
8	Polyester (White)	54°C & 85% RH for at least 2 hours	Perpendicular to ridge (down the roof face)	3 ¼" Ardox nail	5012	367	No disengagement of nails

6 Testing Equipment

Equipment Description	Intertek Inventory Number	Calibration due date
Load Cell Display	280-01-1231A	April 6, 2016
Load Cell	280-01-1231B	April 6, 2016
Scale	280-01-1228	December 23, 2015

7 Conclusion

Intertek Testing Services NA Ltd. (Intertek) has conducted dynamic performance testing for Safe-T-Strap on temporary anchorage connectors conducted in accordance with Section 4.3.3.2 of ANSI/ASSE Z359.1.

The Safe-T-Strap temporary anchorage connectors as described within this report meet the intent of the standard as set forth within ANSI/ASSE Z359.1, Section 4.3.3.2. Static strength testing was not evaluated as part of this test program.

The client is aware of the required markings as per section 5.1.3 of ANSI/ASSE Z359.1 and will be updating the markings going forward.

INTERTEK TESTING SERVICES NA LTD.

Tested and
Reported by: _____
Robert Giona
Team Leader - Building Products

Reviewed by: _____
Claudio Sacilotto, P. Eng.
Senior Project Engineer - Building Products

8 Appendix A - Photographs

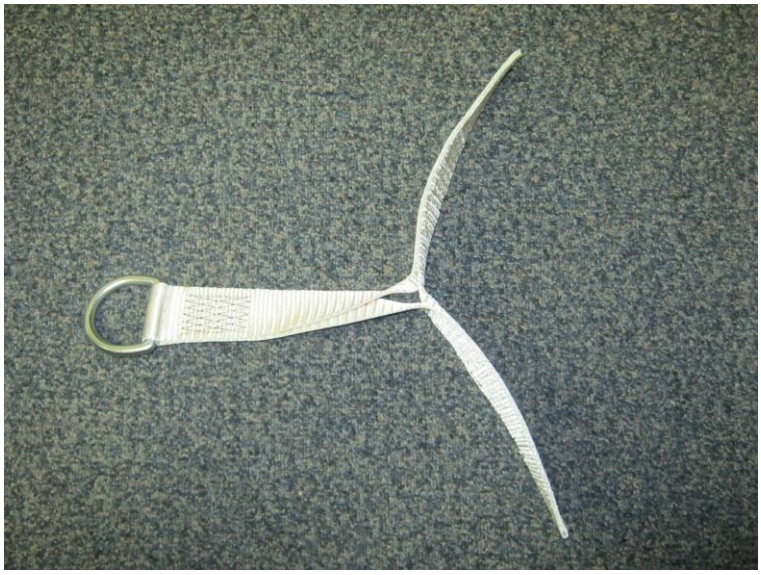

Photo 1: Polyester strap used for testing.

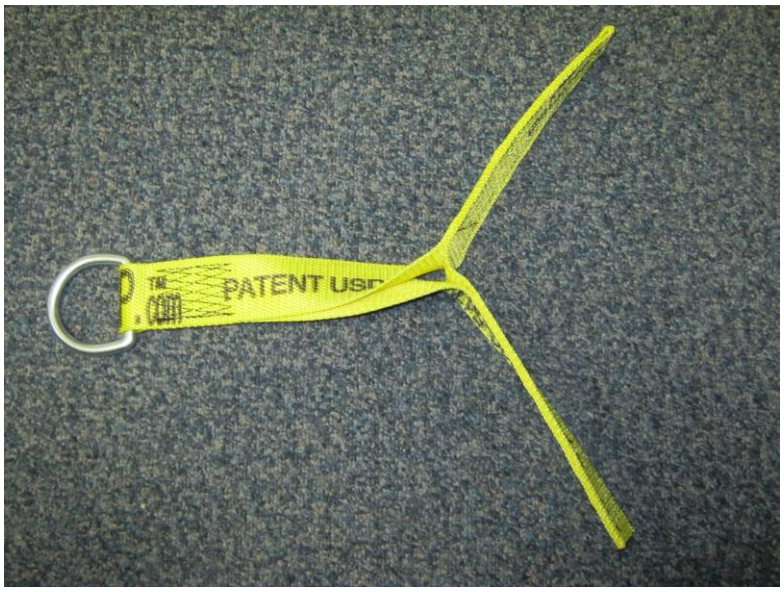

Photo 2: Nylon strap used for testing.

Photo 3: Structural Steel frame used for testing.

Photo 4: Temporary structure with quick release supporting 100kg (220lb) load.

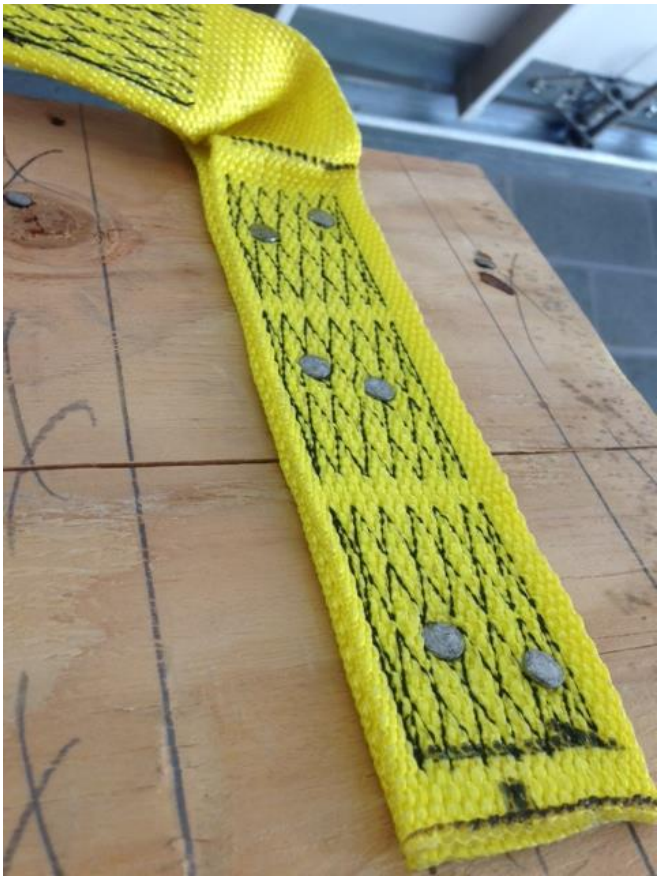

Photo 5: Polyester strap after testing (down roof face).

Photo 6: Polyester strap after testing (over ridge).

Photo 7: Nylon strap after testing (over ridge)

9 Appendix B – Steel Frame Report (4 Pages)

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HGC ENGINEERING
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May 11, 2011

Mr. Steve De Vocht
Safe-T-Strap
1885 Clements Road, Unit 209
Pickering, ON
L1W 3V4

Via email: steve@safetystrap.com

Re: Vibration Response of Drop Test Tower

Dear Steve,

As you know, HGC Engineering visited your facility in Pickering on March 1, 2011 to investigate the vibration response of your drop test tower. Specifically, the natural frequencies of vibration occurring in response to impacts were measured and compared to the requirements of the Canadian Standards Association. This report summarizes the measurements.

The drop test structure is approximately 92" high with the anchor point supported on a W10x33 beam spanning 48" onto two 4" x 4" HSS columns. The base of each column is anchored into the concrete floor and has additional 19" high gussets. The top of the columns are tied back 45" to the exterior building wall. The tower is used to test the D-Ring connection on the High Rise Safe-T-Strap. The test involves choking the strap around the W10x33 beam and dropping 225 lbs of weight 48" from the D-Ring.

Criteria

A number of test standards including CAN/CSA Z259.1-05, Z259.2.1-98 and Z259.2.2-98 require that a test structure having no natural frequencies measured in the vertical axis at the anchor point of less than 200 Hz be used for drop testing. Specifically, clause 6.1.1.5.1 requires that "the natural frequency of the drop test structure measured along the vertical axis of the point of anchorage of the tested system shall be at least 200 Hz".

The specification does not address acceptable levels for frequencies below 200 Hz, which will always be present to some extent due in part to coupling of secondary modes in other parts of the structure. We therefore assume that some vibration below 200 Hz is acceptable, provided that the dominant frequencies of vibration are above 200 Hz.

Test Results

Measurements were conducted using a Hewlett Packard type 3569A real time frequency analyzer (SN 3222A00134) equipped with PCB type J353B52 accelerometer (SN 121000). Frequency response testing was measured utilizing a Kistler Force Hammer (serial number C129408), a PCB Model J353 Accelerometer and the same analyzer. Our instruments are calibrated by NIST traceable laboratories on an annual basis and the correct calibration of the instrumentation was verified on site using a portable vibration calibrator. The Fast Fourier Transform spectrum of the signals was also computed by the instrument in order to display the natural frequencies of the structure.

A number of tests were performed, including striking the anchor point with the Kistler Force Hammer while measuring the acceleration response to determine the mechanical impendence as a function of frequency. A typical spectrum measured in response to a hammer impact at the anchor point is attached to this letter as Figure 1. The results of the test indicate a strong response frequency at 310 Hz with another significantly weaker response occurring near 180 Hz. This secondary mode near 180 Hz is a result of coupling with other parts of the structure and swaying of the structure.

The results of the tests indicate that the requirement of Clause 6.1.1.5.1 and the 200 Hz specification of the CAN/CSA standards are met by the structure.

We trust that this information is sufficient for your current needs however, please do not hesitate to call myself or Brian Howe should you have any additional questions at this time.

Yours truly,

Howe Gastmeier Chapnik Limited

LICENSED PROFESSIONAL ENGINEER
L.R. BONSMA
11/May/11
PROVINCE OF ONTARIO

Ian R. Bonsma, P.Eng.

Brian Howe, MBA, MEng, P.Eng.

Attachments: Photo Plate 1

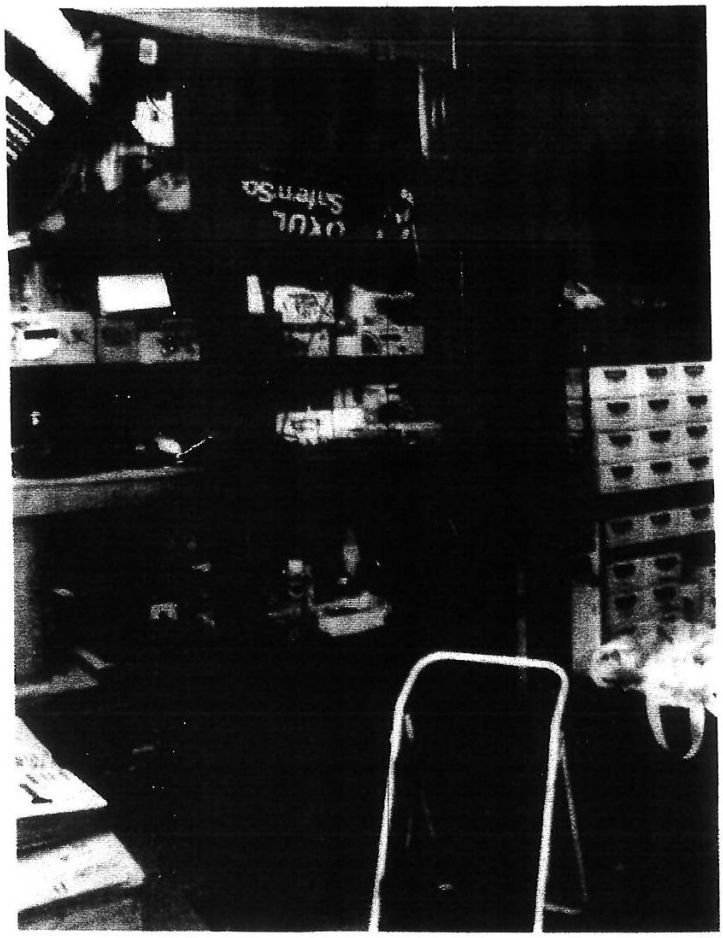
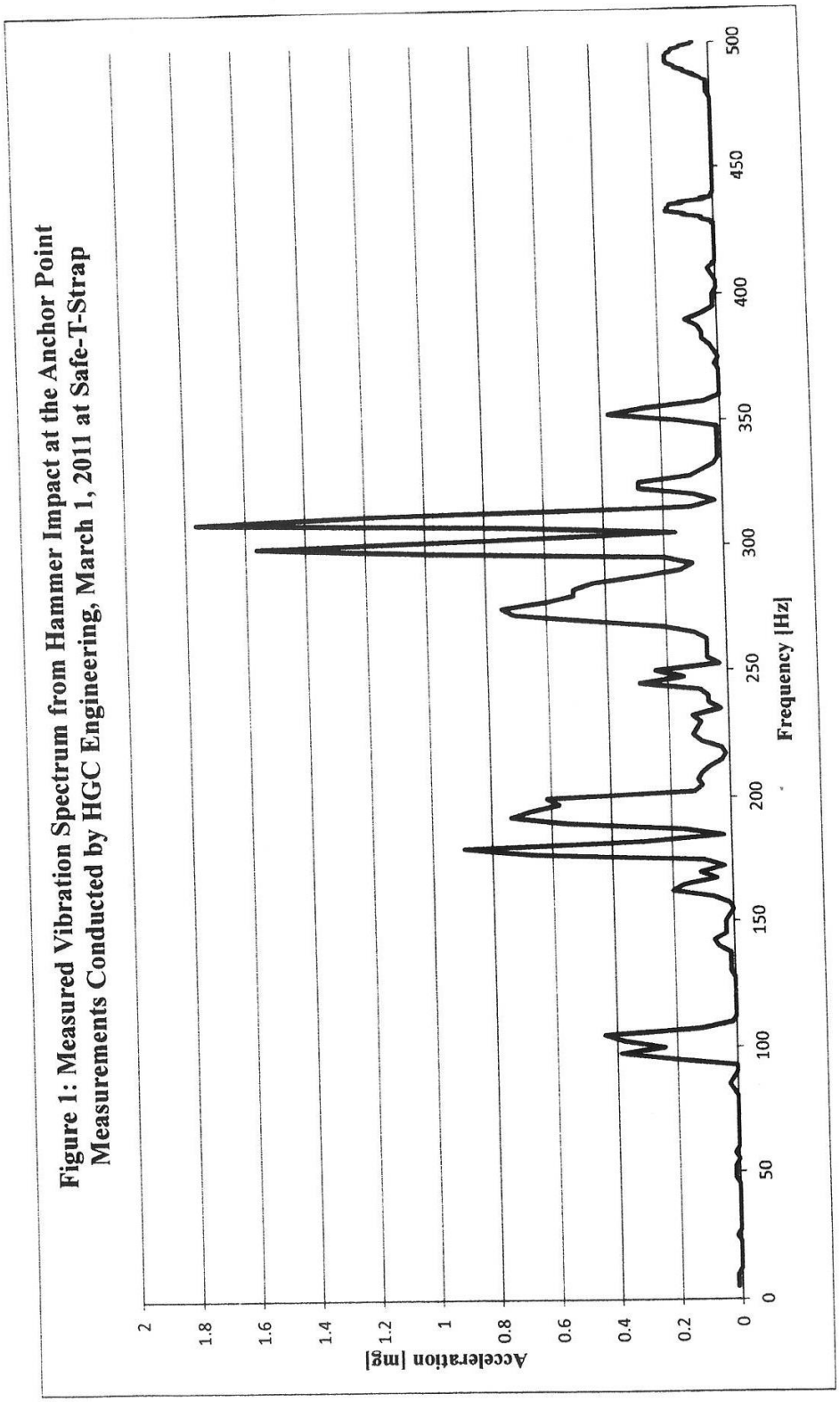


Photo Plate 1

**Figure 1: Measured Vibration Spectrum from Hammer Impact at the Anchor Point
Measurements Conducted by HGC Engineering, March 1, 2011 at Safe-T-Strap**



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10 Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	April 30, 2015	First issue	Robert Giona	Claudio Sacilotto

END OF DOCUMENT