

July 4, 2012

## Hi-Rise (HR-01) & Low-Rise (LR-01) Anchorage Connector Dynamic and Static Load Testing report

Prepared for:

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HITE Project #: 12-8430

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**Introduction:**

HITE Engineering Corporation was commissioned by Safe-T-Strap to study the impact on load bearing capacity by way of removing the end D-rings from the existing HR-01 and LR-01 anchorage connectors.

The testing regime devised for this study was conducted at HITE's testing lab on July 3<sup>rd</sup> & 4<sup>th</sup>, 2012 on HR-01 and LR-01 test specimens supplied by Safe-T-Strap.

**Objective:**

The objective of the engineering study was to establish if the HR-01 and HL-01 temporary anchorage connectors will meet the strength requirements of section 26.7, subsection 2 of Ontario Regulation 213/91 when the D-ring attached to the end of the strap is removed and the sewn loop provides the tie off function.

**Background:**

The HR-01 and HL-01 temporary anchorage connectors are designed, manufactured and marketed by Safe-T-Strap. The existing designs incorporating the D-ring intermediate connectors have been independently tested for compliance with applicable codes and regulations and have been approved for use in Ontario.



**Scope of Work:**

The focus of this study will be exclusively on the impact of removing the d-ring intermediate connector on the load bearing capacity of each anchorage connector. All other aspects of testing of the anchorage connectors have been excluded from the scope of this study.

**Limitation:**

The stated results and concluding remarks are strictly limited to the samples tested under the scope of this study.

**Referenced Documents:**

The following documents provided by Safe-T-Strap were referenced in our review.

- Safe-T-Strap Installation Procedures
- Anchorage connector drawings
- Previous test reports.

**Applicable Code:**

The following code was referenced during our examination of the HR-01 and HL-01 anchorage connectors.

- Ontario Regulation 213/91 as amended

**Test Specimen:**

	Model	Type	Description	Sample Size
1	HR-01	Type 1	Standard HR-01 nylon webbing 2" wide and 41" long with sewn loops on both ends. See figure 1 below.	10
2	HR-01	Type 2	Standard HR-01 nylon webbing 2" wide and 41" long with sewn loops on both ends and one end loop folded. See figure 1 below.	10
3	LR-01	Type 1	Standard LR-01 Polyester webbing 2-1/4" wide and 41" long with sewn loops on both ends. See figure 2 below.	10
4	LR-01	Type 2	Standard LR-01 Polyester webbing 2-1/4" wide and 41" long with sewn loops on both ends and one end loop folded. See figure 2 below.	10

**Specifications:**

	Model	Webbing Type	Webbing width	Overlap length	Stitch type	Overall length
1	HR-01	Dyed yellow Nylon	2 "nominal	7 " nominal	2-1/4"x1-1/2" double zigzag	41 inches nominal
2	LR-01	Polyester	2-1/4" nominal	7 " nominal	2-1/4"x1-1/2" double zigzag	41 inches nominal

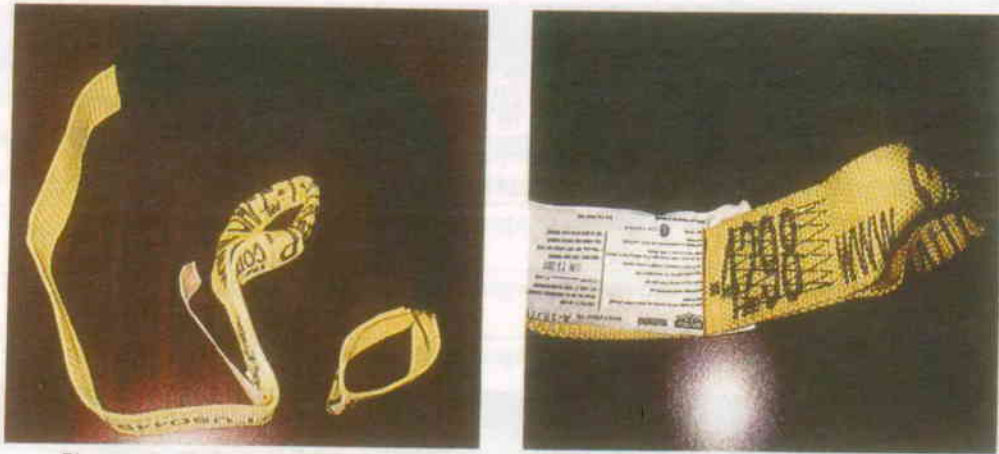


Figure 1: Nylon webbing anchorage connector with sewn loops (TYP)

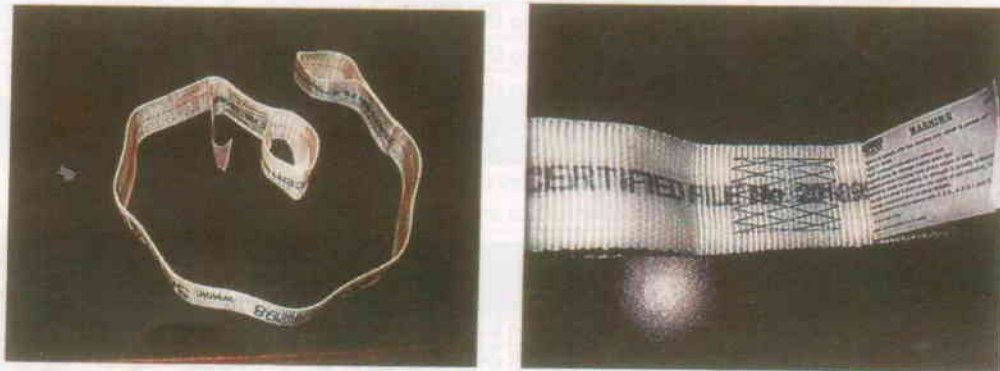


Figure 2: Polyester webbing anchorage connector with sewn loops (TYP)



**Test Methods**

**General:**

The anchorage connectors were subjected to static and dynamic load testing in configurations specified by the manufacturer and the resultant data points were collected from calibrated instrumentation assembled to each test specimen for tabulation and our assessment.

**Static Load Test:**

The static tests consisted of applying a gradual force to the anchorage connector in the direction in which the component is designed to be configured. The force was gradually increased to maximum of 22.5 kN. The anchorage connectors tested were affixed to the test fixture such that the loads applied during the tests were in essentially the same orientation as the load permitted for the anchorage connector during use. Results of the tests were recorded

**Test Results:**

**Nylon Webbing Anchorage Connector**

Test #	AC Type	Static Load Applied	Results	Pass /Fail
1	Type 1	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
2	Type 1	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
3	Type 1	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
4	Type 2	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
5	Type 2	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
6	Type 2	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass

**Polyester Webbing Anchorage Connector**

Test #	AC Type	Static Load Applied	Results	Pass /Fail
1	Type 1	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
2	Type 1	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
3	Type 1	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
4	Type 2	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
5	Type 2	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass
6	Type 2	22.5 kN	No visible damage to the webbing or the stitching was observed	Pass

**Dynamic Load Test:**

Dynamic testing was conducted by means of drop testing. A rigid adjustable weight was dropped using HITE's drop test tower to simulate a fall arrest event.

Dynamic Tests were conducted on 3 samples of each anchorage connector design by dropping a 100 kg rigid weight a vertical distance (free fall) of 1.5 meters. The results of the dynamic tests are summarized in the table below.

**Test Results:**

**Nylon Webbing Anchorage Connector**

Test #	AC Type	Test type	Results	Pass /Fail
1	Type 1	Dynamic drop test	Some minor fraying was present inside loop, however, no other visible damage to the webbing or the stitching was observed	Pass
2	Type 1	Dynamic drop test	Some minor fraying was present inside loop, however, no other visible damage to the webbing or the stitching was observed	Pass
3	Type 1	Dynamic drop test	No visible damage to the webbing or the stitching was observed	Pass
4	Type 2	Dynamic drop test	No visible damage to the webbing or the stitching was observed	Pass
5	Type 2	Dynamic drop test	No visible damage to the webbing or the stitching was observed	Pass
6	Type 2	Dynamic drop test	Some minor fraying was present inside loop	Pass

**Polyester Webbing Anchorage Connector**

Test #	AC Type	Test type	Results	Pass /Fail
1	Type 1	Dynamic drop test	Some minor fraying was present inside loop, however, no other visible damage to the webbing or the stitching was observed	Pass
2	Type 1	Dynamic drop test	Some minor fraying was present inside loop, however, no other visible damage to the webbing or the stitching was observed	Pass
3	Type 1	Dynamic drop test	Some minor fraying was present inside loop, however, no other visible damage to the webbing or the stitching was observed	Pass
4	Type 2	Dynamic drop test	No visible damage to the webbing or the stitching was observed	Pass
5	Type 2	Dynamic drop test	No visible damage to the webbing or the stitching was observed	Pass
6	Type 2	Dynamic drop test	Some minor fraying was present inside loop	Pass

## Conclusions:

Pursuant to the examination and physical testing of the Safe-T-Strap HR-01 and LR-01 temporary anchorage connectors, removal of the D-Ring intermediate connector does not have a negative impact on the overall performance of the anchorage connectors, furthermore, the performance of the folded webbing inside the connection loop compared to the unfolded version were observed to be quite similar. It is therefore the opinion of HITE Engineering Corporation that the examined anchorage connectors without the D-rings are in general conformity with the requirements of section 26.7, subsection 2 of Ontario Regulation 213/91 as amended subject to the conditions and limitations of safe use provided by the manufacturer.

Report prepared by



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