# Test Report
# OSHA 1910 & 1926

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**Test Report Number:** 2020012030800
**Job Number:** Qualification 215
**Product SKU#:** 30800
**Product Type:** Horizontal Lifeline
**Product Description:** 4 Man HLL1 - 82' Temporary Rope Lifeline
**Testing Standard:** OSHA 1910.140 & OSHA 1926.502
**Dates of Manufacture:** 1/01/2018
**Date(s) of Testing:** 7/18/2018

## REQUIREMENT VERIFICATION

| Test Description | Test Date | Clause/Section | Result |
|---|---|---|---|
| Dynamic Performance (Single User) | 7/18/2018 | Conceptual Testing OSHA 1910.140(c)11 & OSHA 1926.502(d)8 | Pass |
| Dynamic Performance (Two Users) | 7/18/2018 | Conceptual Testing OSHA 1910.140(c)11 & OSHA 1926.502(d)8 | Pass |
| Dynamic Performance (3-4 Users) | 7/18/2018 | Conceptual Testing OSHA 1910.140(c)11 & OSHA 1926.502(d)8 | Pass |
| Dynamic Performance (3-4 Users) | 7/18/2018 | Conceptual Testing OSHA 1910.140(c)11 & OSHA 1926.502(d)8 | Pass |

This test report covers these additional products:

Please contact quality@guardianfall.com for signed report.

| Test Equipment | | |
|---|---|---|
| **Equipment** | **Model** | **Serial** |
| Load Cell | 1210AF-10K-B | 916507A |

| Regulatory Requirements | | |
|---|---|---|
| | **The employer must ensure that each horizontal lifeline:** | |
| 1910.140 (c)(11)ii | Is part of a complete personal fall arest system that maintains a safety factor of at least two | Meets or Exceeds |
| 1926.502 (d)(8) | Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two | Meets or exceeds |

| Performance Requirements | |
|---|---|
| This product maintains a 2:1 factor of safety for use to 5,000lb rated anchors | Meets or exceeds |
| Dynamic performance test generates no more than 2,500lb of line tension | Meets or exceeds |

| Dynamic Performance (Single User) | |
|---|---|
| **Samples** | **Sample # 01** |
| Inline Force applied (lb) | 1833.45 |
| Span Length (ft) | Max. |
| Input Force (lb | 1300.52 |
| Post drop line sag (Deflection) (in) | 101 |
| Specimen maintained load | Yes |
| **Result/Assessment** | Pass |

| Dynamic Performance (Two Users) | |
|---|---|
| **Samples** | **Sample # 07** |
| Inline Force applied (lb) | 3620.12 |
| Span Length (ft) | Max. |
| Input Force (lb | 1757.24 |
| Post drop line sag (Deflection) (in) | 102.5 |
| Specimen maintained load | Yes |
| **Result/Assessment** | Pass |

| Dynamic Performance (Single User) | |
|---|---|
| **Samples** | **Sample # 02** |
| Inline Force applied (lb) | 1833.45 |
| Span Length (ft) | Max. |
| Input Force (lb | 1639.67 |
| Post drop line sag (Deflection) (in) | 100.5 |
| Specimen maintained load | Yes |
| **Result/Assessment** | Pass |

| Dynamic Performance (Two Users) | |
|---|---|
| **Samples** | **Sample # 08** |
| Inline Force applied (lb) | 3620.12 |
| Span Length (ft) | Max |
| Input Force (lb | 1842.23 |
| Post drop line sag (Deflection) (in) | 101 |
| Specimen maintained load | Yes |
| **Result/Assessment** | Pass |

| Dynamic Performance 50ft (Single User) | |
|---|---|
| **Samples** | **Sample # 03** |
| Inline Force applied (lb) | 1833.45 |
| Span Length (ft) | Max. |
| Input Force (lb | 1645.67 |
| Post drop line sag (Deflection) (in) | 100.5 |
| Specimen maintained load | Yes |
| **Result/Assessment** | Pass |

| Dynamic Performance 50ft (Two Users) | |
|---|---|
| **Samples** | **Sample # 09** |
| Inline Force applied (lb) | 3620.12 |
| Span Length (ft) | Max. |
| Input Force (lb | 1846.89 |
| Post drop line sag (Deflection) (in) | 105.5 |
| Specimen maintained load | Yes |
| **Result/Assessment** | Pass |

## Multi-User Testing (Fixed Span)

The theory behind multiple user testing is based on the idea that it is not possible for two or more users to fall at exactly the same time. Even if two users fell at the same time, due to a number of factors (user height, attachment equipment, harness fitment, adjustment of rear D, trip/slip/fall mode, user orientation, etc) that the second user would impact the system at a different time to the first user (this may be 1/10 of a second or smaller). Due to this time difference, at the point of impact of the second user, the first user would only be applying a static force of 1kN (equivalent to 100kg), therefore the input would be limited to 6kN max (from the second users' lanyard) plus a maximum 1kN (first user static force). Subsequent users falling would generate an additional 1kN for each user, therefore a 4-user system must withstand 9kN (3kN static for first 3 fallen users, plus 6kN dynamic for forth fallen user).

We conducted physical verification tests for these by performing sequential drops for 4 x users, leaving the static weights hanging on the system for the subsequent users. Our testing confirmed the theoretical 6kN + 1kN per user, as can be seen by the test results below in the Peak Force column (which increases approximately 1kN for each additional user). The initial tension column demonstrates the increase in static tension from the static test weights dropped previously.

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #10 | |
| Span (m) | 5.7 |
| Original Line Length (m) | 5.0 |
| Initial Tension (T) | .031 |
| Peak Force (kN) | 5.34 |
| Static Tension (After Test) (T) | .222 |
| Distance from Ground (m) | 1.1 |
| Total Deflection (Includng Extension) (m) | 3.9 |
| Initial Lanyard Length (m) | 1.9 |
| End Lanyard Length (m) | 2.5 |
| Lifeline Deflection (m) | 1.4 |
| **Compliant** | Yes |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #11 | |
| Span (m) | 5.7 |
| Original Line Length (m) | 5.0 |
| Initial Tension (T) | .222 |
| Peak Force (kN) | 6.44 |
| Static Tension (After Test) (T) | .347 |
| Distance from Ground (m) | .98 |
| Total Deflection (Includng Extension) (m) | 4.0 |
| Initial Lanyard Length (m) | 1.9 |
| End Lanyard Length (m) | 2.5 |
| Lifeline Deflection (m) | 1.5 |
| **Compliant** | Yes |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #12 | |
| Span (m) | 5.7 |
| Original Line Length (m) | 5.0 |
| Initial Tension (T) | .347 |
| Peak Force (kN) | 7.22 |
| Static Tension (After Test) (T) | .490 |
| Distance from Ground (m) | 1.1 |
| Total Deflection (Includng Extension) (m) | 3.9 |
| Initial Lanyard Length (m) | 1.9 |
| End Lanyard Length (m) | 2.5 |
| Lifeline Deflection (m) | 1.4 |
| **Result/Assessment** | Pass |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #13 | |
| Span (m) | 5.7 |
| Original Line Length (m) | 5.0 |
| Initial Tension (T) | .507 |
| Peak Force (kN) | 8.31 |
| Static Tension (After Test) (T) | .624 |
| Distance from Ground (m) | .85 |
| Total Deflection (Includng Extension) (m) | 4.2 |
| Initial Lanyard Length (m) | 1.9 |
| End Lanyard Length (m) | 2.5 |
| Lifeline Deflection (m) | 1.7 |
| **Result/Assessment** | Pass |

## Multi-Span Static Testing (Fixed Input Load)

Tests were performed to demonstrate the inline forces in the HLL system when set up over various spans. For continuity, the only variable changed was the span. The system was set between anchor points, and the inline pre-tension measured. A static input load of 400kg was applied at the mid-span of the system (constant for all spans) and the inline force measured. A load of 400 kg was chosen as an equivalent force to 4kN, which was previously the peak force measured in the original test data. The maximum static deflection was also measured and recorded.

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #14 | |
| Span (m) | 5 |
| Pre-Test tension (kN) | .123 |
| Inline force at 880lb (400kg) (kg) | 650 |
| Deflection (m) | 1.04 |
| **Result/Assessment** | Pass |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #15 | |
| Span (m) | 10 |
| Pre-Test tension (kN) | .85 |
| Inline force at 880lb (400kg) (kg) | 692 |
| Deflection (m) | 1.48 |
| **Result/Assessment** | Pass |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #16 | |
| Span (m) | 15 |
| Pre-Test tension (kN) | .42 |
| Inline force at 880lb (400kg) (kg) | 611 |
| Deflection (m) | 2.2 |
| **Result/Assessment** | Pass |

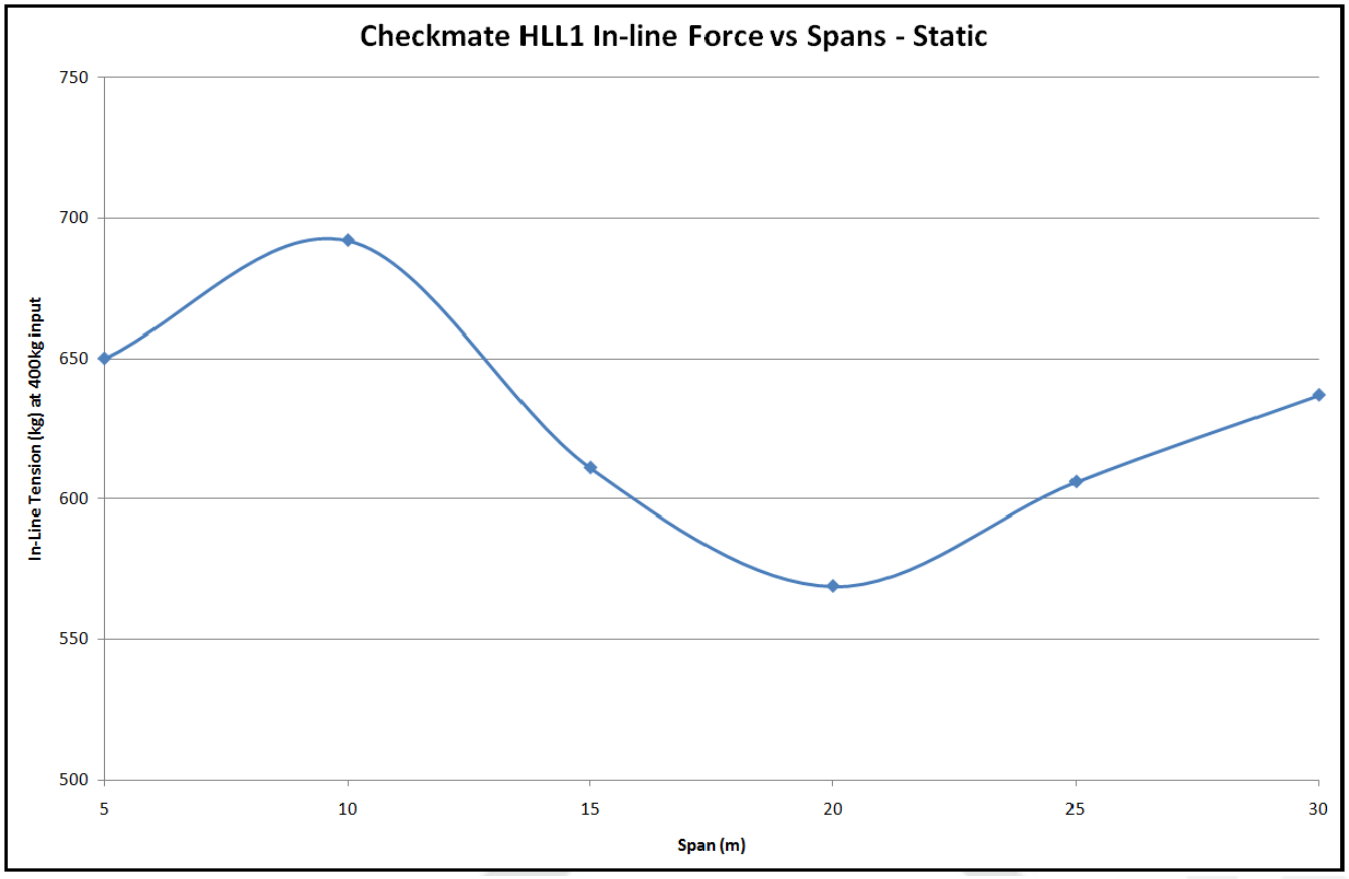
| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #17 | |
| Span (m) | 20 |
| Pre-Test tension (kN) | .58 |
| Inline force at 880lb (400kg) (kg) | 569 |
| Deflection (m) | 2.93 |
| **Result/Assessment** | Pass |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #16 | |
| Span (m) | 15 |
| Pre-Test tension (kN) | .42 |
| Inline force at 880lb (400kg) (kg) | 611 |
| Deflection (m) | 2.2 |
| **Result/Assessment** | Pass |

| Dynamic Performance Testing (Single User) | |
|---|---|
| Sample #17 | |
| Span (m) | 20 |
| Pre-Test tension (kN) | .58 |
| Inline force at 880lb (400kg) (kg) | 569 |
| Deflection (m) | 2.93 |
| **Result/Assessment** | Pass |

## Multi-Span Static Testing (Fixed Input Load) (Cont.)

These tests demonstrate that the in-line tension is highest for short spans, and reduces as the span increases, up to a point where the higher deflections in the line increase the tension. On the graph below, the 5m test was conducted with a much smaller pre-tension in the line, hence this is lower than the 10m result (but still higher than the longer spans).




## Conclusion

The testing detailed above has demonstrated three points:
- The original master test data meets and far exceeds the requirements of EN795
- Dynamic testing has been performed to verify the integrity and performance of the system for up to 4 users, and to verify the theory of +1kN for each user
- Static multi-span testing has been conducted to demonstrate the integrity of the system over its full range of spans and the associated inline tension.