December 22, 2020

Flent Ballantyne, President
Ballantyne Gear
403 Powerhouse Ste 301
McKinney, TX 75071

Re: Engineering Certification of the Eveook System by Ballentine Gear, to the ANSI Z359.6 2016 standard

Since 2013, I have been retained (through High Engineering Corp from 2013 to 2016 and through Elevated Insight and Engineering Ltd. (EIEL) from 2016 to present) as part of the engineering team developing the Eveook system for fall protection on roofs. I am a structural engineer and a Qualified Fall Protection Engineer. I am one of the principle authors of the ANSI Z359.6 standard for the Design of Active Fall Protection Systems. I worked with Ballantyne Gear as part of a team that engineered and designed the Eveook components and system. I designed most of the test structures and protocols used to evaluate the Eveook and various aspects of the system.

Eveook Anchorage Connector Testing:

My review and analysis included, up to the date of this letter, suitable inspection, testing, analysis and computer modelling of the Eveook anchor assembled in accordance with the following sketch, using parts as supplied and assembled by the manufacturer as detailed in the table of components in the System Testing and Modelling section of this certification letter.

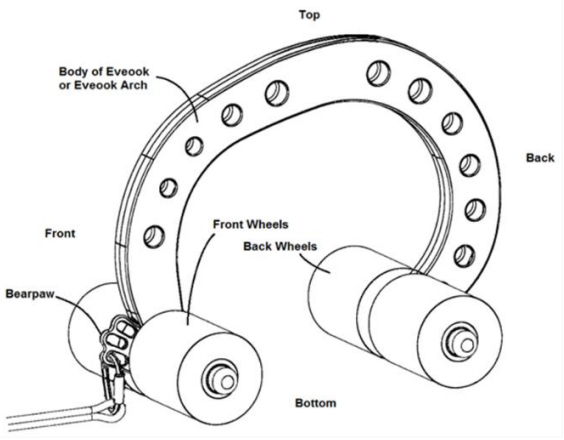


Figure 1 - Assembled Eveook

Testing of this component (which serves as an anchorage connector to anchor fall protection systems to the Eave of a roof), is briefly summarized, below:

1. The raw strength of the Eveook body when pulled from the bearspaw to the opposite set of wheels bearing on the eve, exceeds 8,000 lbs.,
2. Testing on a simulated wooden Eave on a roof sheeted with 5/8" standard construction grade OSB, demonstrated that the Eveook would tear up the roof at a force varying between 3,000 and more than 5,000 lbs. This force is more than double the peak impact force an Eveook is likely to encounter in arresting a fall when used in accordance with the Ballantyne Gear's Technical Manual. If (due to abuse) the force exceeds the tearing force, it will behave as an energy absorber that will absorb 16 feet of fall energy for every foot the Eveook tears up the roof. The total available energy absorption is proportional to the length of roof that it can tear up, meaning that workers would have to free fall more than 100 feet in order to exceed the energy absorbing capability of the Eveook system. I conclude that COMPLETE STRUCTURAL FAILURE OF A PROPERLY INSTALLED EVOOK IS NOT POSSIBLE when arresting a fall.

Evaluation and Testing of other parts of the Eveook System:

Testing of other components is briefly described below:

1. Friction of the Camp Safety Lithium Rope over the peak of the roof and over the Eave for various roof slopes and roofing materials, to enable computer modelling to predict performance of the system for a wide variety of roof slopes and materials.
2. Friction between a worker and various roofing materials to determine the fictional resistance slowing workers sliding down a roof, to calculate reduced impact energies into the system.
3. Force vs stretch testing of the Lithium ropes used for Anchor Lines and Adjustable Life Lines, to determine the fall energies and stiffness properties of this rope at various loadings. Note that all testing was performed on virgin rope which will have the greatest stretch and least energy absorption. Predicted clearances for the assembled systems provided by the software are based solely on virgin rope. Predicted Forces for this rope are based on rope that is 25% stiffer than virgin Lithium rope.
4. Static Force vs movement down the rope of the Camp Safety Goblin was undertaken to determine its performance as a personal energy absorber.

System Testing and Computer Modelling:

The term “Properly Installed” is defined within this letter as being installed in strict compliance with the requirements of the training supplied by Ballantyne Gear or its authorized agents.

The components utilized in a Properly Installed Eveook System, as at the date of this Certification, include the following:

Product Name	Component	Drawing Number or Reference	Manufacturer	Notes
Assembled Eveook Including all components shown on the undated PNG drawing provied by Ballantyne Gear and as shown on the last page are as follows:	Assembled Eveook Body of Eveook (Eveook Arch): Axels: Shaft Collar: Wheels: Bearspaw:	EVH151-01 EVH15-02-356 Rev G Mar 2019 EVH15-06 EVH15-08 EVH15-16 orEVH15-18 EVH15-14, EVH15-15, EVH15-24, EVH15-25	Ballantyne Gear	No Substitutions
Semi-static rope, Lithium 11 mm, terminated with fixed loops, stitching and plastic coating			CAMP Safety	No Substitutions without authorization from Ballantyne Gear.
Giant		0997	CAMP Safety	No Substitutions
Goblin		0999	CAMP Safety	No Substitutions
GT ANSI Full Body Harness		2661	CAMP Safety	Substitutions may include other harnesses that meet ANSI standards and have a ventral D-ring, a sternal D-ring, and a Dorsal D-ring.
Goblin Lanyard - Webbing Lanyard 40 cm		2030040F	CAMP Safety	No Substitutions without authorization from Ballantyne Gear. Can be used with or without Rope Surfer for Goblin. Rope surfer not required unless rope worker is suspended.
Goblin Rope Lanyard - Rope Lanyard 60 cm		213902	CAMP Safety	No Substitutions without authorization from Ballantyne Gear. Can be used with or without Rope Surfer for Goblin. Rope surfer not required unless rope worker is suspended.
Line-Launcher			Specialty Products	No Substitutions without authorization from Ballantyne Gear. RRT Lucky Launcher II
Miscellaneous Components to complete the system	including carabiners, Multi-Anchors, Nano 22, Rope Protector, Prussiks, etc.		Ballantyne Gear and Camp Safety	No Substitutions without authorization from Ballantyne Gear.

My review and analysis involved, up to the date of this letter, suitable inspection, testing, analysis and computer modelling of the components of the system and various "Properly Installed" Eveook systems.

Testing of "Properly Installed" Eveook systems, is briefly summarized, below:

1. Static Testing to measure Anchor Line (AL) forces (including forces applied to the Eveooks) when transverse loads are applied to the ALLs.
2. Static Testing to measure Adjustable Lifeline (ALL) forces (including forces applied to the Eveooks) when loads are applied in line with the ALLs.
3. Dynamic testing of various configurations of the Eveook System, using a 310 lb. test mass.
4. Limited Dynamic Testing of humans in deliberate attempts to fall off the roof, to verify the effect of roof slope and the friction of various roof surfaces. This data improved the accuracy of the Computer model.

Computer Modelling of Eveook system performance is briefly summarized, below:

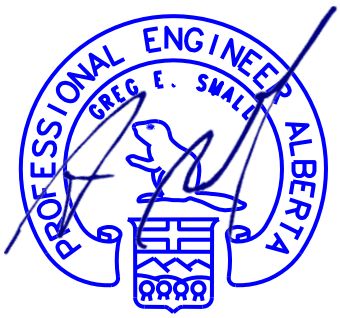
1. It follows the requirements of ANSI Z359.6-16.
2. It calculates the performance of the system using the actual weight of the worker. The system has been engineered for a maximum 310 lb. worker weight in accordance with the requirements of ANSI Z359.6-16.
3. It uses Energy Methods to consume the energy of the falling worker(s) is in the applicable energy absorbing mechanisms, including the Goblin Rope Grabs, stretch of the Lithium rope, friction resisting workers sliding down a roof and friction of lithium rope over the peak and Eave of the roof.
4. It incorporates a minimum one foot of harness stretch, as well as a clearance margin of 2 feet plus 10% of the Maximum Anchorage System Deflection (MASD). This adds three to five feet to the required clearance as compared to what would be measured in a dynamic test with a rigid test mass.
5. It assumes the Lithium rope is "virgin" (has not been previously loaded). Used Rope will have less stretch and greater stiffness than is assumed by the computer model, and may require less clearance.
6. Non-linear behavior of the Lithium rope was incorporated into the computer model assuming it behaves in a linear fashion, using an elastic modulus for virgin rope, but only absorbing 65% of the energy that would be absorbed by this rope if it behaved in a linear fashion.
7. The model analyzes possible fall scenarios, according to the distance a worker is from the Eave of the roof. The user must specify in the software, how far a standing worker's toes are from the roof edge ("T-E"), with a light tension to their Adjustable Anchor Line (AAL). Scenarios analyzed by the computer software include:
    - The worker is far enough from the edge that they are in travel restraint and it is impossible to fall off the roof.
    - The worker is close enough to the edge that if their feet were to slip, their torso could slide and fall off the roof.
    - The worker is close enough to the edge (or has slack in their Adjustable Lifeline) to Free Fall five or more feet). The more slack the worker has, the greater the free fall and the greater the clearance requirement. Slack can be generated by swing fall action when the worker is at a location where his Adjustable Anchor Line is not perpendicular to the roof edge, particularly when working at a roof corner. Slack can also be generated by careless positioning of the Goblin Rope Grab/Fall Arrester on the Adjustable Lifeline such that a worker can reach and step off the roof. The software will analyze this scenario and determine the required clearance according to the distance the worker's feet are from the roof edge with light tension. Use of the Eveook system in deliberate fall arrest must be reviewed and approved by a Qualified Person who shall compare the required clearance to the available clearance.
    - The worker is traversing or working from a ladder or working on scaffolding or suspended in a bosun's chair that is below the Eave of the roof. The Goblin rope grab must be continuously positioned above the worker to minimize Free Fall. The Goblin Fall arrester must not be allowed to hang below the worker (this may allow a free fall that is more than double the Goblin Lanyard Length (GLL) and will increase the required clearance by 2.75 x GLL for a 250 lb. worker). Free Fall = 0 ft when the Goblin Rope Grab is positioned above the worker with light tension in the Adjustable Anchor Line. Free Fall = 2 x GLL when the Goblin Rope Grab is hanging below the worker's harness.

8. A Significant Ridge (where the Anchor Line deflects more than 20 degrees over a ridge in the roof) provides intermediate support for the Anchor Line. Based on testing, the computer model assumes maximum slide of six inches along the ridge before it becomes a support point for the Anchor Line. When the Line deflects less than 20 degrees, the computer software assumes the ridge does not provide any restraint to reduce deflection of the Anchor.

Certification:

1. This system was engineered and tested to meet the requirements of ANSI Z359.6-2016 and CSA Z259.16-15. It exceeds requirements of US OSHA CFR 1910.140 Appendix D and CFR 1926.502 Appendix C.
2. This system and all components exceed the strength factors of safety required by the above standards.
3. All users of the system must be trained by Ballentyne Gear or its authorized agent.
4. This system must be installed and used in strict accordance with the training by Ballantyne Gear or its authorized agents.
5. When workers are located on the roof, it is safer and preferable to use the system in travel restraint. The software analyzes the potential for a fall for whatever scenario has been input into the software, according to the distance a standing worker's toes are from the edge ("T-E") and there is a light tension in the Anchor Line. The worker is in travel restraint when the software indicates it for the specified value of "T-E".
6. When traversing a ladder at the eve, onto and off a roof, there will be enough slack in the system to permit a fall to occur. When a worker is stepping between the ladder and the roof, ensure that the adjustable anchor line is perpendicular to the edge and that the Goblin rope grab is positioned on the Adjustable Anchor Line (AAL) such that there is light tension in the AAL at the point that the user's feet are both on the ladder. The computer model can assume T-E = -2 feet (toes are 2 ft past the edge of the roof) when traversing onto and off a ladder.
7. All workers who use this system must be trained in the applicable techniques for fall protection on the roof and/or suspension off the side of the building.
8. The peak forces at the Eveooks, the closest approaches to the roof edges to remain in travel restraint, and the required clearances when a fall is possible are determined for each configuration of the Eveook system, using the software I have provided to Ballantyne Gear for distribution with the Eveook system.
9. This system may not be used for fall arrest or suspension unless a rescue plan has been developed and is ready to be implemented in accordance with ANSI Z359.2.
10. Any modifications to this system or deviations from the instructions in this certification letter or the Eveook Manual must be reviewed and approved by Ballentyne Gear or a Professional Engineer qualified in Fall Protection Engineering.

If you have any questions, please do not hesitate to contact me.



PERMIT TO PRACTICE
Elevated Insight & Engineering Ltd.
Signature
Date ***December 22, 2020***
PERMIT NUMBER: P-13771
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

State of Arizona BTR Firm Registration 20385-0 ***April 13, 2023***

Greg Small, M.Eng., P.Eng.
Founder – Elevated Insight &Engineering Ltd.