

Gravity Link, a secondary retention

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Agenda

- Who we are and what we are doing
- The problem we solve
- The product – what it is

GRAVITY8

Who we are and what we are doing



Gravity8 is a Norwegian company established in 2017 by;
Alf Kristian Fjelldal and **Robert Kolsing**

Who we are and what we are doing

Gravity8 AS specialize in dropped object solutions

Gravity8 has developed a dynamic link under the brand name **Gravity Link**

Gravity Link was developed to prevent objects with heavy weight from falling down



What is it?

- The GravityLink
- It is a shock absorber!
- It is not a spring!
- ***It is a safe guard***



What does it do?

- GravityLink stretches about 400%
- 90% energy reduction
- To be installed between a potential dropped object and an anchor point



Why use it?



Talk about
The Gravity Link!

Use
The Gravity Link!



Annex M

Hierarchy of Controls

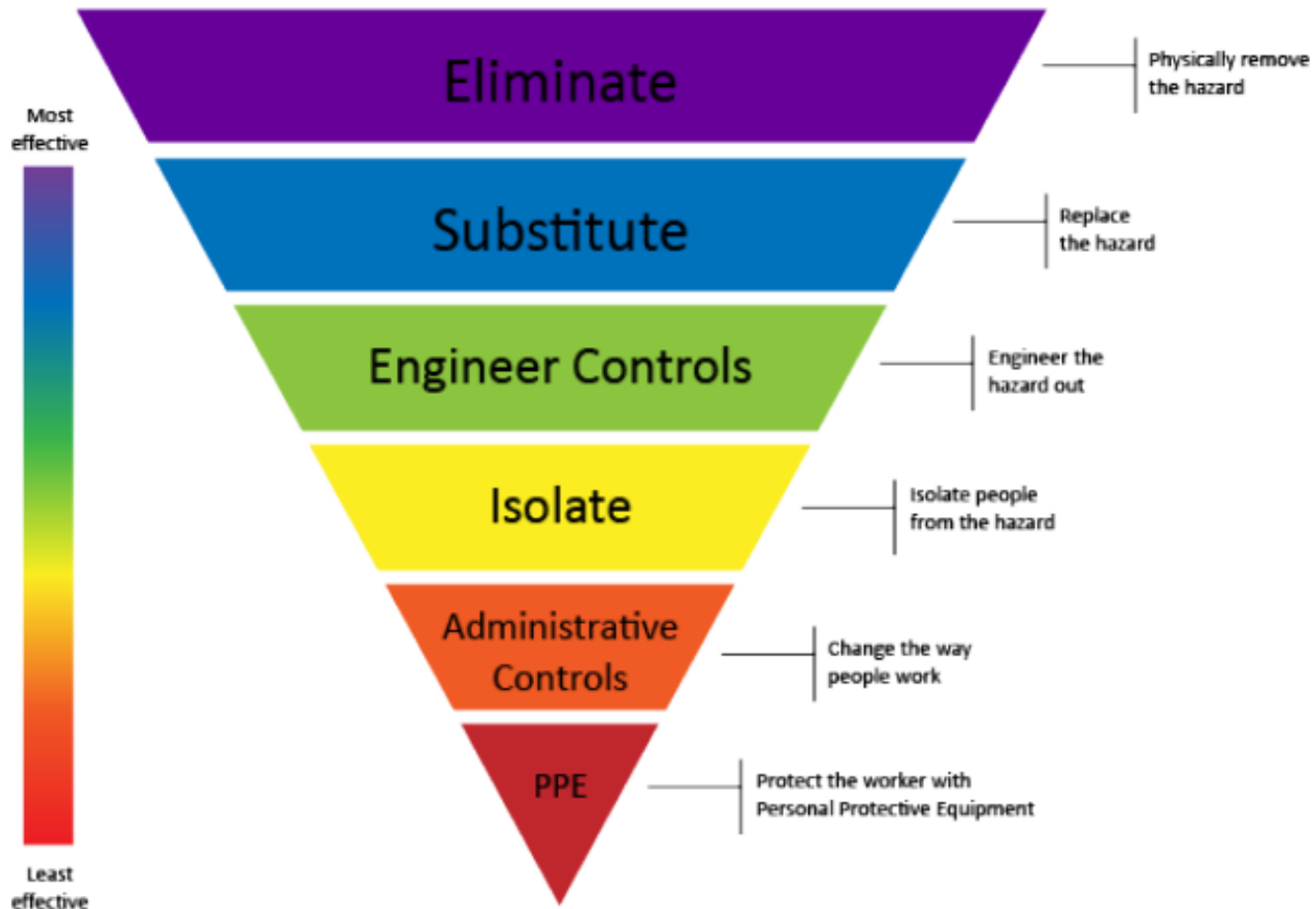


Figure from Dropsonline

The problem we solve

Secure object heavier than 50 kg.

Common situation; just leave the object without the secondary retention.

Because of:

- 1) The size of the wire rope.
- 2) No relevant anchor point strong enough to hold the objects stop energy.



Examples of calculations

Object mass	W kg	50	100	150	200	300	500	1000	5000
Free fall height	mm	500	500	500	500	1000	500	500	500
Rope dimension	mm	8	8	18	12	24	20	36	36
Rope length	mm	1000	1000	1000	1000	800	1000	1000	1000
Elastisity	MPa	45000	45000	45000	45000	45000	45000	45000	45000
Potensial energy Ek	J	245	491	736	981	2943	2453	4905	24525
Cross section area	mm ²	27	27	135	60	241	167	541	541
Stiffness of wire rope	N/mm	1206	1206	6075	2709	13535	7518	24353	24353
Strecht length	mm	20	29	16	27	21	26	20	45
Tension load on only rope	kN	24	34	95	73	282	192	489	1093
Elongation %	%	2 %	3 %	2 %	3 %	3 %	3 %	2 %	4 %
MBL 1570 N/mm ²	kN	33	33	169	75	299	208	673	673
Wirerope AISI 316 7x19		OK	Crack	OK	OK	OK	OK	OK	Crack
Impact factor wire rope	R/W	6.08	5.30	6.76	5.42	8.00	5.54	6.09	4.48
Stiffness of coil	K	0.98	1.96	2.94	3.92	5.89	9.81	19.62	98.10
Modulus of coil	M	157	314	471	628	942	1 570	3 139	15 696
Stretch of coil	(d) mm	500	500	500	500	500	500	500	500
Impact factor	F/W	2.41	2.41	2.41	2.41	2.73	2.41	2.41	2.41
System force (anchor point)	Fa [kN]	1	2	4	5	8	12	24	118
Forces reduced to	%	5 %	7 %	4 %	6 %	3 %	6 %	5 %	11 %

Examples of calculations

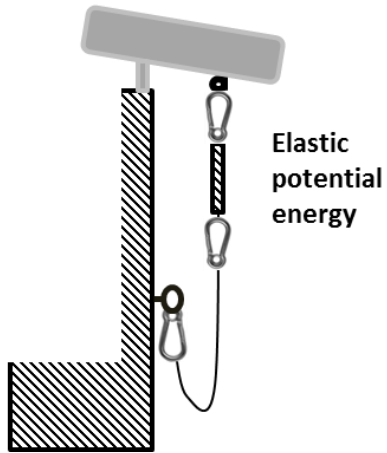
The most important four lines in the calculation that shows a theoretical reduction with more than 90% of forces acting on the anchor point.

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Forces reduced to	%	5 %	7 %	4 %	6 %	3 %	6 %	5 %	11 %

The theory behind the GravityLink

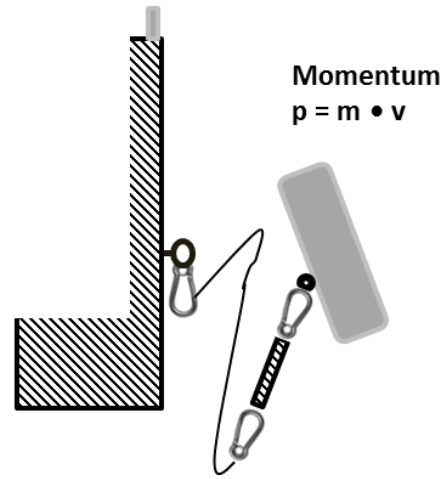
STATIC POSITION

Potential energy
 $PE = m \cdot g \cdot h$



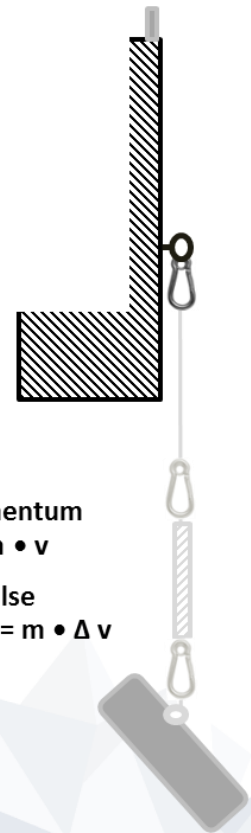
DROP

Kinetic energy
 $KE = 0.5 \cdot m \cdot v^2$

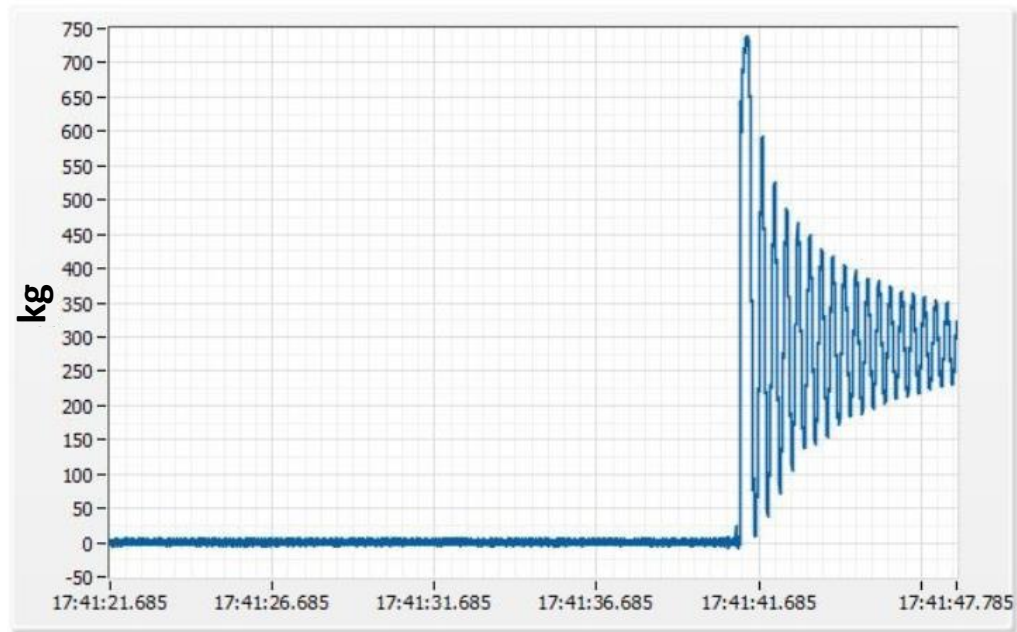


COLLISION

Momentum
 $p = m \cdot v$
Impulse
 $F \cdot t = m \cdot \Delta v$



Testing and calibration facilities



The drop testing and calibration take place in our own testing lab.



An electronic loadcell is sending signals directly to a software in the computer and enable detailed analyzes of the drop.

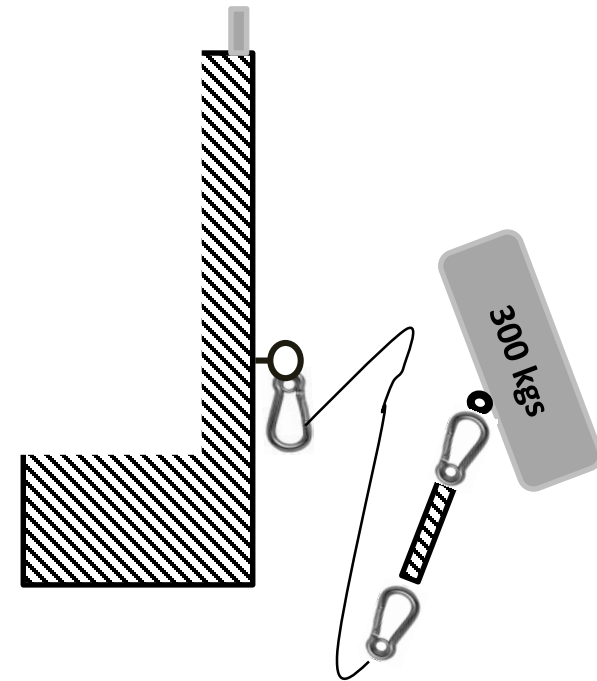
Case Example for GravityLink

WEIGHT OF OBJECT: 300 KG

DROP LENGTH: 1 METER

A rigid steel **wire rope** working as a secondary retention will be exposed to a force approx. 282 kN

If the GravityLink is mounted in-line as the secondary retention, the force will be reduced to approx. 8 kN



Conclusion:

A REDUCTION OF FORCE > 90%

What can the GravityLink secure?

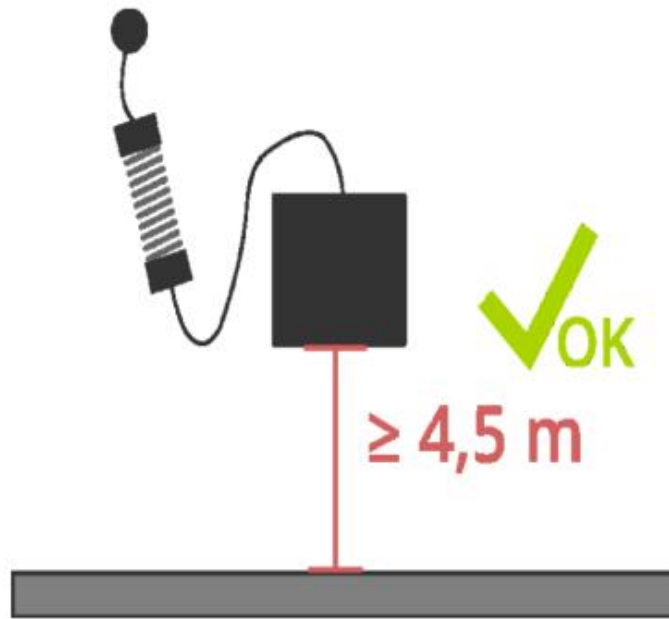
In order to work efficient with objects from 10 and up to 500 kgs, the GravityLink is available in multiple sizes. The product is designed to be mounted on an anchor line where the purpose of the anchor line is to work as the secondary retention in case of an object drop.

The secured objects might be;

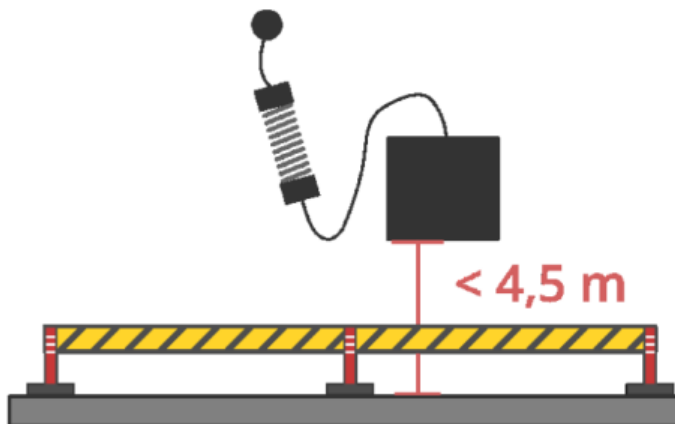
- floodlights,
- crane boom cameras,
- telecom antennas,
- derrick equipment (snatch blocks)
- machines and moving tools
- or any other object anchored to a structure



Safety underneath the GravityLink

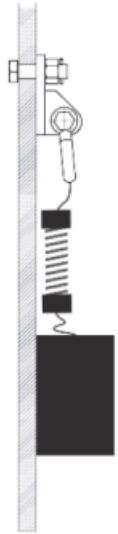


- In spaces where personnel is present, the ground clearance of secured object shall be min. 4.5 meter and without restrictions.

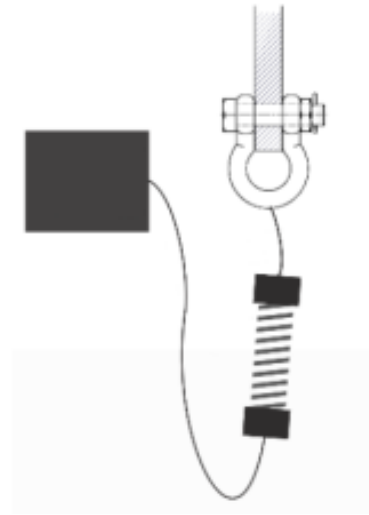


- If ground clearance of secured object is less than 4.5 meter, then area underneath should be closed or stricted to personell,

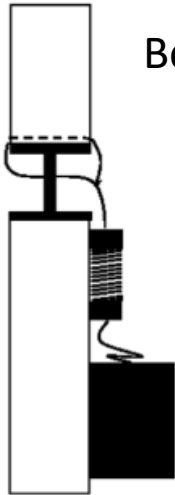
Installation of the GravityLink



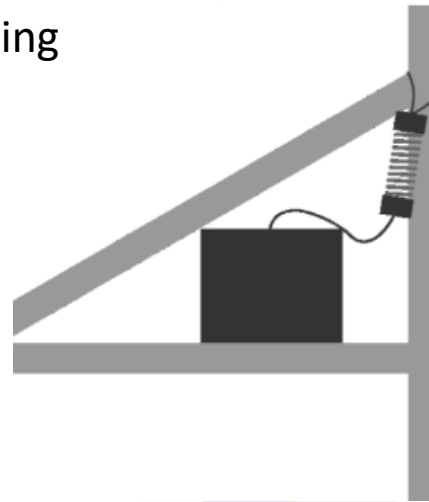
Wall mounting



Edge mounting



Beam Structure mounting

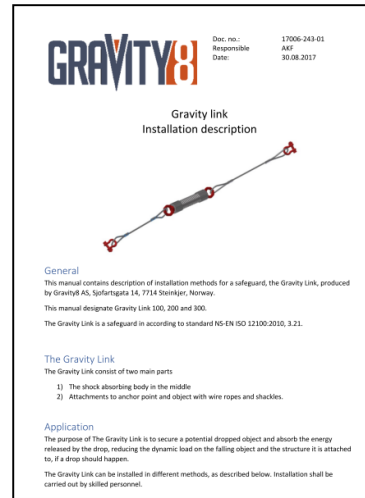


Lattice Structure mounting

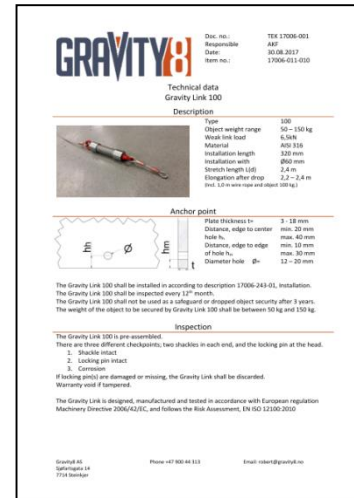
Documentation and certificate



Declaration of Conformity



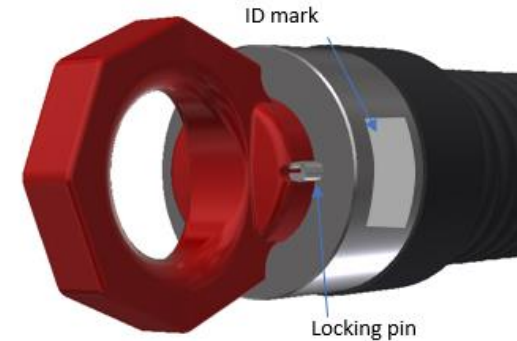
Installation Description



Technical Data



Dynamic Link Testing



Summary

The Gravity Link is a Patent Pending product that is engineered and produced in Norway.

GravityLink is an active safety barrier that will stay inactive until the object falls from its static position.

A GravityLink mounted on the anchor line can reduce up to 90% of the energy from a falling object.

Go to www.gravity8.no to see the videos



Thank you for your attention !