

REPORT #652065

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Test Report on 10 meter Free Fall Dropping of Carabiners

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April 3, 1995

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Purpose: To determine the effect of dropping a carabiner made of 7075-T6 aluminum (the industrys standard material) on a solid surface. Since carabiners are heat treated to attain a very high strength, it has been questioned if the material becomes brittle enough that a drop on a hard surface will effect its strength.

Overview of Procedure: Carabiner frames are dropped 10 meters onto a concrete floor. Their strength was then measured by testing their open gate strength on a tensile tester. Comparisons are made of the average strength and standard deviation, to a set of control carabiners.

Procedure (complete): Out of 50 MSR produced REI D and Oval carabiner frames, 15 of each were chosen at random for drop testing, and 15 of each randomly selected as a control. A lift was used to position the drop height at 10 meters + or - 20 cm. The carabiners were then dropped 1 at a time. On 4 of the 6 drops the carabiners were rolled off my hand in an effort to get them to hit the concrete on the corner of the carabiner. On the remaining 2 drops the carabiners had a "spin" placed on them, to try to make them land "flat" (in the same position they would rest on a table).

After completion of the drops, the carabiner frames were tested as open gate carabiners. 1/2" greased pins in aluminum blocks were used to transfer the load to the carabiner. Load was applied using a JILoydd tensile tester at 50 mm/min. The load cell has a 50kN capacity and was last calibrated on 11/22/94.

Results: All test values in KiloNewtons

Sample #	Oval		D-Shaped	
	6 Drops	0 Drops	6 Drops	0 Drops
1	8.83	8.52	7.85	7.77
2	8.72	8.7	7.69	7.73
3	8.8	8.63	7.72	7.81
4	8.7	8.47	7.86	7.83
5	8.65	8.52	7.75	7.78
6	8.66	8.35	7.92	7.73
7	8.53	8.55	7.88	7.97
8	8.75	8.64	7.83	7.85
9	8.69	8.49	7.89	7.64
10	8.62	8.65	7.75	7.78
11	8.69	8.32	7.86	7.82
12	8.66	8.5	7.73	7.72
13	8.4	8.33	7.7	7.86
14	8.38	8.3	7.84	7.86
15	8.5	8.47	7.83	7.55
Spread	0.45	0.4	0.23	0.42
Average	8.639	8.496	7.807	7.780
Std Dev	0.133	0.128	0.075	0.100

Conclusions: Repeated drops at 10 meters have no noticeable effect on the carabiners frame strength. With both the D's, and the Ovals, the average strengths seem the same, and the standard deviation is no greater in the dropped carabiners than with the control carabiners. This data will support the decision that if carabiners are dropped in the stores, or in the warehouse: they will be inspected and returned to stock if they have proper gate operation, and like new appearance.