(c) The helmet shall be supplied, sized to 1/8 sizes, and shall not incorporate any interior suspension for the purpose of sizing. Sling suspension may be used only as a major part of the energy absorption design (this is presently not feasible, but future developments should not be ruled out).

4. *Desirable Optional Features*

(a) Ventilation holes or slots, if effective and not resulting in an unreasonable compromise with the other prime requirements.
(b) Minimum weight; 1 lb. is a desirable maximum.
(c) Bright color, either white or international (fluorescent) orange.
(d) Quick release chin fastening, adjustable, non-creeping.
(e) Minimum use of leather and other organic materials.
(f) Quotation by the manufacturer of the actual minimum level of performance attained during Snell impact tests.

EQUIPMENT TESTING

The Oregon section during 1965 has instituted a testing program of equipment. The following table presents their data obtained in the field using a Dillon Dynamo meter and an anchored "come-a-long" device to apply the force. In examining this and subsequent tables, one should keep in mind that failures below 2,000 pounds are probably unsafe because there will be piton failure before there is a failure of the rope. This assumes that one is using a rope that is rated to hold 4,000 or more pounds and assuming the worse effect of a knot that can reduce this to 50%.

Figure 1 demonstrates the appearance of some of the ice screws after testing. Note particularly numbers 23 and 24 and compare with Figure 2.

In the past other tests have been done on various items of hardware. Most of these have been done in the laboratory under controlled conditions. This is probably a better and more standardized way of testing equipment for comparative purposes. On the other hand, such tests do not take into account the variability of the material, rock or ice, in which the piton will be used. The laboratory tests do, however, indicate the stronger items and certainly these should withstand stronger forces if well placed than the weaker items.

In 1961 Everett Lasher tested a number of pitons, rings, and carabiners, using a Dillon Dynamo meter rated to 5,000 pounds. His head speeds in general were 0.544 inches per minute. In some cases on rings he used 0.1 inch per minute. The results of these were published in detail by Recreational Equipment, Inc. (Seattle).

Everett Lasher kindly summarized his results for this report. Many of the ring pitons failed at the weld on the ring. These results confirm those reported previously by Art Lembeck who reported that ring pitons can be dangerously weak, that is, they may fail at 900-1,240 pounds. This would be adequate, however, for easy rappelling, but if one carried two types of pitons and selected the wrong one at a critical moment, a serious accident could occur.

Lasher commented that all of the rings, whether rings on pitons or descending rings distorted (i.e. became oval) prior to failure so that this should be anticipated, and if seen, no greater stress should be applied to that ring.

Only two of the 15 types of carabiners tested fell below the 2,000 pound level. One was a large D-safety carabiner marked CCB. This occurred in three out of four samples. Those carabiners that gave results above 2,000 pounds were Army aluminum (2,360), Bedayan aluminum (2,460), French Allair D-aluminum (2,320), Marwa Safety (3,600), Cassin #18 – 1200 kg. (3,250), Cassin #19 oval – 1,000 kg. (2,920), Cassin #19-B oval – 1,200 kg. (3,540), Cassin #20 Large-D (3,080), Cassin #21 Large-D Safety (4,000), Cassin #23 oval – 1,300 kg. (4,120), Cassin #24 oval – 1,800 kg. (5,000 – no failure – still worked well), Japanese D Safety Kujtu (4,000). (Numbers in parentheses are pounds at failure.)

Failure of a rope is uncommon, however, in this report there are incidents in which this has occurred. Some have been due to cutting by sharp rock. This is a situation that must be especially avoided particularly with nylon. Nylon can sustain extraordinary stress, but is extremely susceptible to cutting action. In this respect it is worth noting again the report from the U.S. Army Natick Laboratories entitled "A Survey of the Deterioration of Nylon Mountain Climbing Ropes." In that report they stated that wear was an important factor and that nylon rope should be "retired" after 100 days of use because of wear and tear. Such use would reduce its strength by approximately 20 percent. It is essential to emphasize that these are days of use in the mountains. Naturally there is a variation about this. If a rope holds a fall it probably should not be used thereafter as a climbing rope. It could be used as a fixed rope or possibly for standard rapelling.

Perlon rope has also come in for criticisms, largely because its outer sheath prevents adequate inspection of the strands. In general the same standards as stated above should apply. In addition, if the perlon rope demonstrates a sharp angle or a limp quality in any segment these are indications of severe damage and that rope should be discarded.

The question of the quality of a rope has also been raised from time to time. In the United States probably the best solution as to the quality of the rope that one is planning to purchase is to ensure that the rope meets U.S. Military standards.

Certain accidents reported this year deserve special comment. The first is the first fatal accident reported to us as a result of building climbing. Some may argue that this is not mountain climbing in the pure sense. They are correct. On the other hand, building climbing may be compared to practice-cliff climbing. Obviously the result may be equally serious.

Other accidents involved failure of a rope. In one instance the rope was severed by sharp rocks and the victim (McQuarrie) fell to his death. Whether this could have been avoided is hard to determine. One must be constantly aware of the fact that nylon rope is extremely strong under tension, but can be cut or sheared extremely easily. In another instance the rope actually broke in a fall and death resulted. In this case the perlon rope had had a moderate amount of use and had also held a body's fall. Any rope that has held a serious fall should not be used again for climbs where it may have to sustain another serious fall. Naturally the crux of

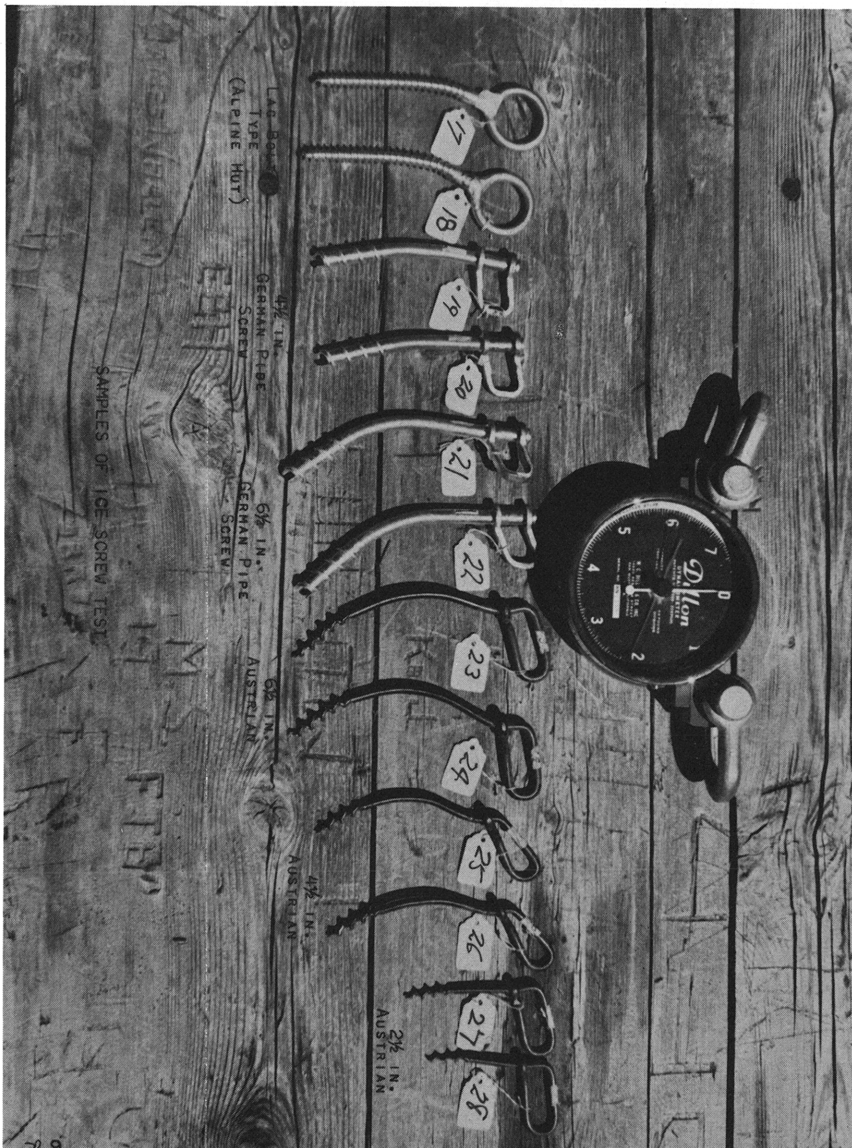

Figure 1

Deformation of ice screws as a result of tests.

Sample No.	*Size and Type of Screw*	*Angle of Pull*	*Pounds of Tension to Release*	*Time in Ice Before Pull*	*Air Temperature*	*Remarks*
1	Aust. 4½" screw	90°	1700	3 min.	Unknown	All tests were in the fall of the year.
2	Aust. 6½" screw	90°	2150	3 min.	Unknown	
3	Tubular Piton	90°	1700	3-4 min.	Unknown	Tube broke part way out
4	Slotted Piton	90°	400	3-4 min.	Unknown	Ring broke
5	Aust. 4½" screw	180°	750	3-4 min.	Unknown	
6	Aust. 4½" screw	180°	875	3-4 min.	Unknown	
7	Aust. 6½" screw	180°	1200	3-4 min.	Unknown	Samples 1-16 were tested at approx. 8,000 feet elev.
8	Aust. 6½" screw	90°	2255	3-4 min.	Unknown	
9	Aust. 6½" screw	90°	2110	3-4 min.	Unknown	
10	Aust. 6½"	180°	1248	3-4 min.	Unknown	
11	Aust. 6½"	180°	1189	3-4 min.	Unknown	
12	Aust. 4½"	90°	1710	3-4 min.	Unknown	
13	Aust. 4½"	90°	1728	3-4 min.	Unknown	
14	Aust. 4½"	180°	850	3-4 min.	Unknown	
15	Aust. 4½"	180°	807	3-4 min.	Unknown	
16	Tubular Piton	90°	1600	3-4 min.	Unknown	End distorted from driving solid ice.
17	Lag Bolt type	90°	1750	3 min.	33°F	
18	Lag Bolt	90°	1325	2 min.	33°F	Bad ice
19	Gr. Pipe screw	90°	2000	2 min.	33°F	Soft ice
20	Gr. Pipe screw	90°	2200	4 min.	33°F	Solid ice
21	Gr. Pipe screw	90°	2100	2 min.	33°F	Solid ice
22	Gr. Pipe screw	90°	2100	5 min.	33°F	Solid ice
23	Aust. ice screw 6½"	90°	1100	5 min.	33°F	
24	Aust. ice screw 6½"	90°	1150	3 min.	33°F	Samples 17-29 were tested at approx. 7000 ft. elev.
25	Aust. ice screw 4½"	90°	700	2 min.	33°F	
26	Aust. ice screw 4½"	90°	950	2 min.	33°F	
27	Aust. ice screw 2½"	90°	800	2 min.	33°F	
28	Aust. ice screw 2½"	90°	275	3 min.	33°F	
29	Tubular Piton	90°	750	3 min.	33°F	

these comments is the word serious — how serious is serious. Certainly free falls of 30 or more feet should be classified as such. The critical point in the fall is that point or section of the rope that passes around the carabiner. Here it is angulated and severe strain occurs. *Beware of the rope that has caught one fall. It has done its duty!*

An incident last year occurred on Washington Column in Yosemite and involved a rappel in which Baldwin was killed. Although the exact series of events is not known, there are a number of comments that indicate that possibly Baldwin was not psychologically in tune with the climb. Whether this played a role here or not is unclear. It does, however, point up the dictum that if one is not psychologically ready for a given climb it is better not to make that climb that day. You become a menace to yourself and to others in the party. *Sometimes it takes more courage to turn back than to go ahead — albeit of a different sort.*

SAFETY COMMITTEE, AMERICAN ALPINE CLUB, 1965

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