

BMC Technical Conference 2008: Real World Product Testing

Extract from lecture given by Ken Ledward, KLETS Equipment Testing

Background as OB Mountain Instructor at Eskdale UK and Loitokitok East Africa.
Past member of the BMC Safety and Technical Committee.
Currently working on research and development of outdoor equipment, major concentration on the end-user factor by extensive field testing.

KLETS early impact into the outdoor trade was the introduction in 1976 of the KLETS OUTSOLE UNIT, adopted by Karrimor in their KSB Range, by Zamberlan in their Lite Series and by Brasher in their Hillmaster Range. A modification of the KLETS SOLE was sold to Vibram for use on the Asolo Scout for sales into USA. The mountain version of this Vibram sole, Art.1032 remains a popular all-round mountaineering sole.

KLETS registered as a business name 11th September 1978.

We are a team of twelve men and four women with each of us having a friendly second opinion tester and are able to obtain a group opinion at any time. All have an understanding of the footwear and clothing trade and are qualified in teaching outdoor activity over a range of disciplines. We test items in preparation for retail sales two years hence.

PART ONE: FIELD TESTING.

First assessment of fabrics/coatings/laminates done in close co-operation with factory agents, in depth laboratory work done to decide on a short list. KLETS acknowledges the unbiased work done by Leeds University Textile Dept. in fine-lining this short list for field test evaluation and to Dr Julie Gretton late of Pertex, now with Berghaus Limited.

The best two items from the short list will be made-up for the field trials; vests, midlayers and shell garments and rucsacs produced in `split` form.





The original idea for the `split` garments came from discussions with Peter Lockey* and Gordon Davidson* who had noted some fabric was abraded more than others by carriage of rucksacs. The `split` fabric test really does establish best resistance to abrasion from sac and harnesses, moisture vapour transmission, damp retention, also any deterioration in performance from regular washing/spin drying etc. I have been close to the outdoor industry for many years. Berghaus are the only company I know who have committed to this in depth field test process.

NB. It is acknowledged that most outdoor users may wear the same vest type in winter also as the only torso cover in summer. See PART TWO regarding the differences resulting from sac contacts with all vests.

It is very straightforward to compare footwear items. One proven item in any category is worn on one foot whilst a new trial item is worn on the other foot. By doing a permutation of all in test we are able to quickly form an opinion on fabric/leather, design/fit and overall performance.

Sample prototypes are field tested to mimic the wide range of end use applications. There are likely to be modifications to each product as the test hours progress, we require a minimum `no fail` performance up to 200 hrs in main item and any components before recommending a move to a second prototype sampling, this time in both men's and women's specification.



We realised many years ago that it is essential to use all test items in every type of weather condition possible including use in the hours of darkness, this in winter we have found, gives a real test to establish if a product is user-friendly; no use having a complicated fastening for clothing or sacs, or fancy shaped zip closures if they cannot be opened when conditions are gale force winds, torrential rain, or extreme cold. It is quite obvious that many of the designers `out there` have not once tried to open/close their product pockets when wearing gloves! One KLETS tester pulled his jacket up through his climbing harness in an effort to close a water-proof-like-zip from hip level, the effort was unsuccessful.

The regular evaluation of a wide range of products from all international brands can be an indicator of good and bad design, also of component features. When a test demands we need to be at a higher level than Nevis and Cairngorm areas and in sub-zero for longer periods, we have no hesitation in moving abroad to capture those conditions.



Except when testing a tent we prefer our overnights to be in a bivvy bag with the extra protection of a KLETS Storm Hood. This latter is a mini single hoop tent made for us originally by May Blackstock of Mountain Range, one time producers of bomb-proof mountain clothing, now sadly no more.

The KLETS Storm Hood can be accessed from either side and shared by two people for cooking or map and note taking out of the wind and the rain. The bivvy-hood system requires very little `footprint`, no faffing about with lots of wildly flapping tent fabric to set-up and a bonus of being able to pack and move off very quickly.

In the same vein of simplicity, we always have with us a survival unit on group hill days. In 1976 I modified the original Zardsky Bag. Put a draw corded entrance at each end, same as the original then added a huge draw-cord to the bottom hem. I took this to Karrimor and recommended it to be sold as a `sew it at home` item. They thought it merited wider marketing after trialling it with me and my OB Eskdale Group, it became the KISU and was bought by almost every outdoor centre and mountain rescue team. It has since been given several new lives as blokka bag/barn shelter etc.

When I see the prices of these copy items I chuckle at the comment made by Tom Waghorn in Climber and Rambler. He had tested the original KISU and thought it not comparable with a plastic survival bag due to its price - £27.



During the final phases of testing, all product is made available for assessment to retail buyers and to leading outdoor writers. Product is also selected by the sponsor of the test for training sessions with their own sales staff. One of our main clients Berghaus is bold enough to offer the pre-production item to general public evaluation at events like Ambleside Walking Festival. It is usual for any item that has completed a KLETS Field Test to progress to successful retail marketing.

PART TWO: EXTRACT FROM THE TEST COMPARING `NATURAL YARN` AND `SYNTHETIC YARN` VESTS.

Full report at www.klets.co.uk NATURAL v SYNTHETIC BASE LAYERS.

Discussion over several years with Dave Brook of Leeds Textile Dept. resulted in us taking the decision to personally fund a field test programme that will give some clear indication if the wearing of a natural yarn against the skin was better or worse than a synthetic yarn against the skin.

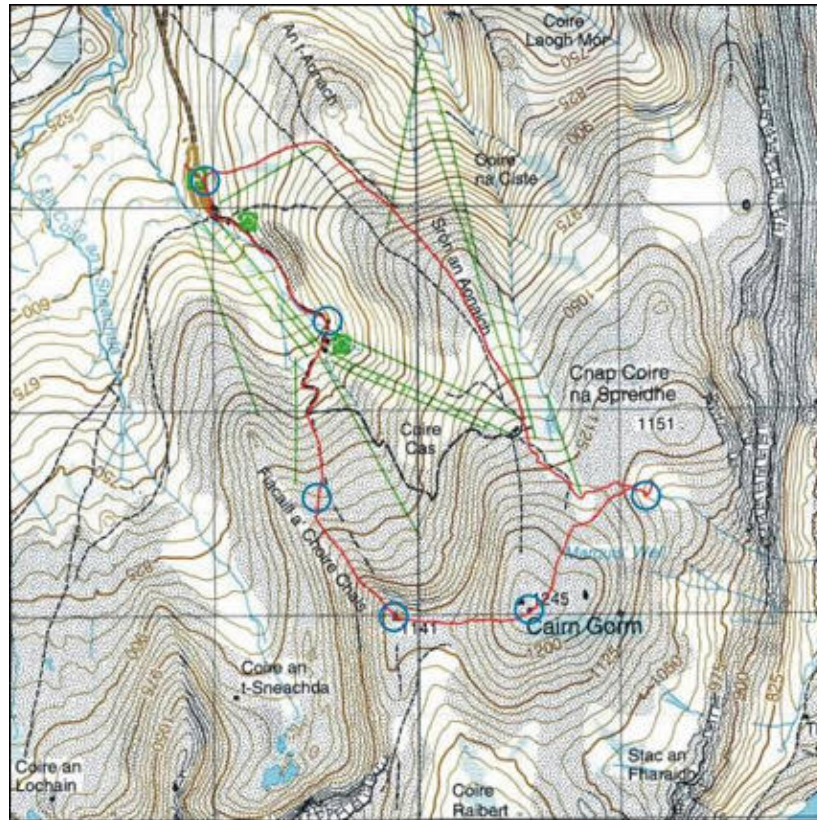
Firstly I conducted a survey among two full-time outdoor centres, three mountain rescue teams, professional mountain guides, hill shepherds and many people met * during my winter mountain trips in 2003/2004. A total of 254 people offered opinions on what their preferences were for next-to-the-skin comfort. We selected four most popular vests from this survey and added to this list four of the most recent `new Merino Wool` vests.

* An interesting fact emerged from the survey, retired men and women spend more hours `on the hill` than other groups questioned.

Glenmore Lodge was selected as our activity base. Good accommodation with excellent food, facilities to update our micro-sensors and lap tops plus a drying room for maintenance of our clothing. It was important that we had a high level route that would give consistent winter conditions. After discussion with Allen Fyffe AIMG i/c Scottish Mountain Leader Training, we agreed on a route that was possible in all but the most extreme wind conditions.

The route selected would start at the Main Ski Car Park at Cairngorm Day Lodge,

follow the old track to The Shieling, onto the Fiacail a` Choire Chais and up to Cairn 1141M then to the summit of Cairngorm, down via Marquis` Well to Ciste Mhearad for a lunch stop. Return over the top edge of Ptarmigan Bowl Ski Area and descend the North Ridge to the starting point.



The most popular clothing layering from the survey was vest as the base layer, fleece as the mid-layer with a variety of waterproof or windproof jackets as the shell.

We established two clothing systems for the comparison testing:

1. SYNTHETIC.

Base. Polyester vest – Mid. Polyester fleece – Shell. Goretex 3 Layer.

2. NATURAL.

Base. Merino Wool Vest – Mid. Shetland Wool Sweater – Shell. Double Ventile.

On each field tester we placed a micro-sensor on the front torso between the skin and the base, between the base and the mid, between the mid and the shell. Both moisture level and temperature was to be recorded simultaneously. Ambient conditions were taken using micro-sensors and mechanical gauges.



A miniature voice recorder was used for timing at each compulsory stop and to monitor the reaction of the field tester to the changes in micro-climate, overall weather conditions.

Some will have heard of the 1988 ICE STORM conditions recorded in Canada. It is believe we noted a similar phenomenon on 27th January 2005. After leaving Cairn 1141M in Force 3 wind with sac straps and jacket cords being blown about, at the summit of Cairngorm the straps and cords were frozen at angles varying between 15 and 20 degrees, yet the temperature recorded was +1 degrees C.



At the same time we discovered later, the climbers in Coire an t-Sneachda had abandoned their climbing due to ropes and slings becoming rigid.



Retaining a good comfort level suited to mountaineering requires that clothing layers are matched to the activity level. The clothing must pass moisture vapour well and after high level activity, any serious dampness in the clothing should start to lessen as the activity level decreases.

The first significant difference between the natural and the synthetic was noted during the initial ascent. The relative humidity between the skin and the vest in the synthetic clothing system did not rise significantly, suggesting a good comfort level was being maintained. The relative humidity in the natural clothing system however, increased greatly during this first ascent, indicating retention of moisture.

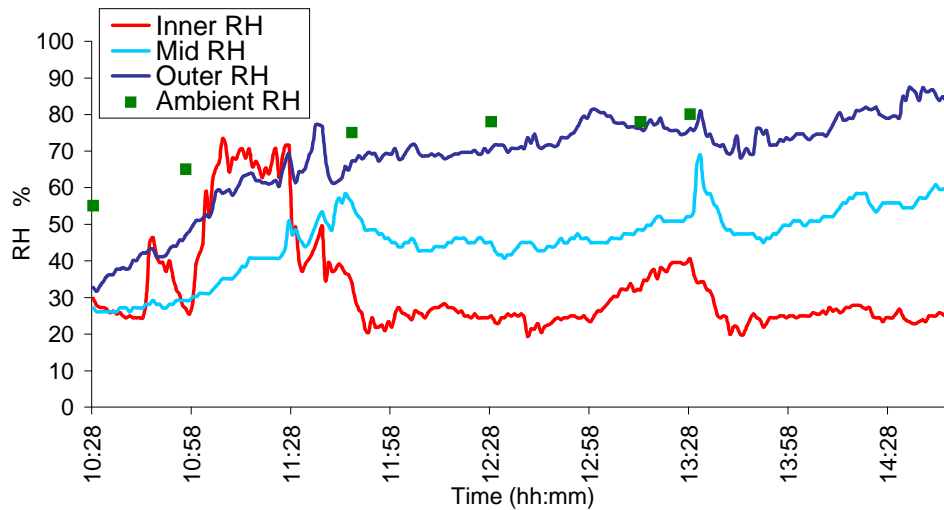
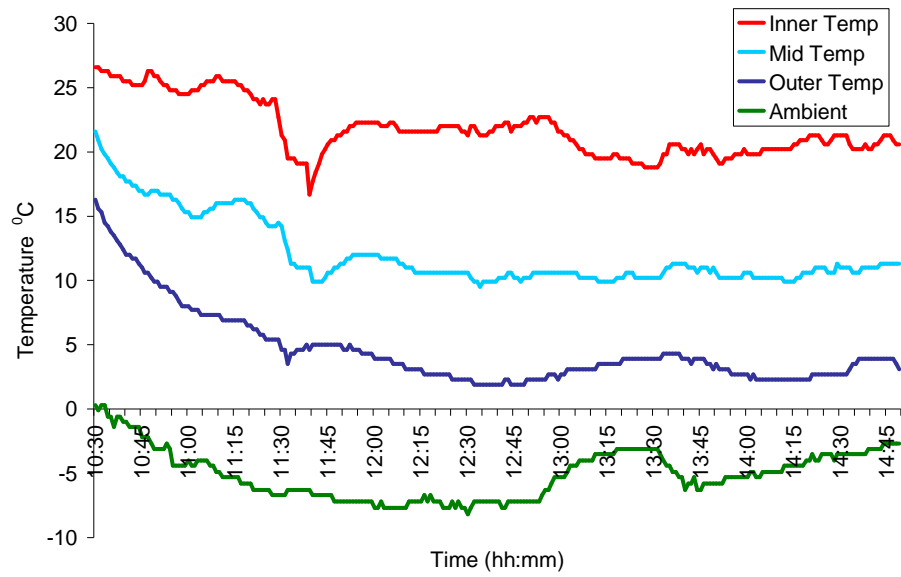
At the point of the first stop, the natural clothing system exhibited a significant cooling particularly at the skin/vest interface, resulting in the chilling of the wearer, this continued throughout the session at each stop. This cooling in the natural clothing system is likely to be the result of the retained moisture within the fabric and between the layers, increasing the thermal conductivity of the layers.

At the point of the first stop, the synthetic clothing system rose slightly in temperature and no chilling was experienced. This reflected the lower retention of moisture within the fabric and between the layers. Only during the high wind speed day did chilling occur during use of the synthetic.

In all low level energy output where moisture was not retained in the micro climate, it was found that Merino performed as well as any of the synthetic yarns yet, a small number of the testers did not wish to persevere due to a wool/skin irritation. There is more detailed discussion in the full report regarding the three layer clothing system.

One example of a good micro-environment within a clothing system can be seen in the graphs below, indicating temperature and humidity respectively.

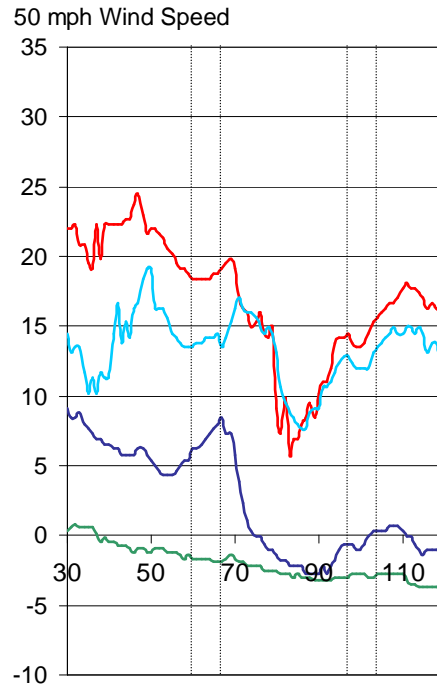
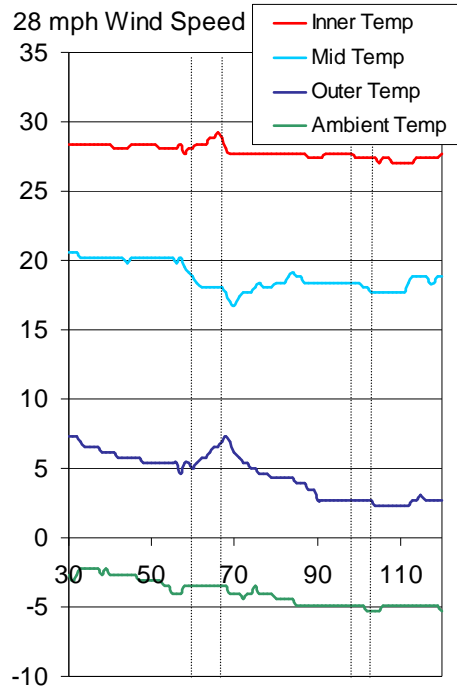
NB. The sudden RH rise at 1058hrs is explained in the full report.



The effects of wind in any ambient temperature can greatly effect the micro-climate within a clothing system. Our experience indicates clearly, that up to a windspeed of 35mph/ Beaufort Force 7 all of the clothing we were using managed to retain its shaping. The warm air pockets, relative to each fabric type, had been retained both in the yarn depth and between the fabric layers.

In winds in excess of 30mph the clothing layers were pressured against each other and against the body. Warm air is compressed and forced out of the fabric; the increased windspeed will then profile the clothing around the torso, forcing remaining warm pockets out of the total micro climate.

On the day we had experienced a 50mph/80kph/Beaufort Force 9 windspeed, the ambient temperature for one short period matched the temperature on the immediate inside of the shell garment at minus 3 degrees C.



Although the chilling experienced during this field testing was not life threatening, it does demonstrate the potential threat posed by retained and cooled moisture in clothing layers. In strenuous sessions, when the base layers are not performing well, usually the whole clothing system cannot cope with the moisture vapour generated.

Many people undertaking strenuous outdoor activity will have experienced that, in continuous precipitation, the waterproof/`breathable` shell garment is unable to cope with the massive amount of water vapour trying to escape. In such situations, water droplets from inside the shell will soak back into the mid and even the base layer.

This compounds the moisture that has already accumulated in the base layer. If the wearer becomes immobilised even for a short time, or the pace becomes very slow, the retained moisture and resultant chilling can become life threatening. This form of wind pressure induced Conductive Heat Loss over a long period on the hill, if accompanied by wet cooling in the micro-climate, can be the trigger to start early stages of hypothermia. I believe it was this chain of events that was experienced by the young people from Edinburgh on Cairngorm in 1970.

The differences during the winter field testing showed clearly that for the most part, a good micro-climate is more easily attained and retained using a synthetic clothing system. At all other times, when the base layer was in use as the only torso covering, we had major fabric damage to the Merino Wool from regular sac and harness contacts. From the field testing, we have moved forward and discovered some alternative layering combinations, developed many theories and an understanding of the best micro-climate temperature ranges that can be worked upon to optimise the performance of clothing systems, one that will more correctly link the natural yarn and the synthetic yarn to the benefit of all users.