Building in the Snow

By Donald Charles Maclurcan

PRIOR to the last two or three years the State Government has strongly resisted any attempt by private organisations to erect buildings on our snow fields in the Southern Alps around Mount Kosciusko. Recent relaxation of this policy has seen an interesting variety of Lodges and Shelter Huts spring up on the ranges, erected through the enthusiastic efforts of private clubs interested in the great sport of ski-ing and ski touring. I have visited nearly all of these buildings and been technically connected with the work on some, and now set down for you some of my impressions and some of the lessons which may be learned.

Building in the snow!

Shall we begin with the site? Siting a building in the snow country is of the greatest importance in order to ensure that:

(a) It is reasonably accessible in bad weather.

(b) A natural water supply is nearby.

(c) There is a proper scour.

Accessibility is related to other matters. A snow lodge in a certain place may be called reasonably accessible for expert skiers, but dangerous for beginners. Therefore, compromise is usual after giving due consideration to such things as sunlight penetration into the valley chosen for the building and snow deposition. It is obvious that a site reached easily would be nevertheless valueless if it was too much in shadow for a long period of the winter day and was placed where very little snow settled.

The scour business is quite a thing. Being the representative of a distinguished and enthusiastic country ski club on the Ski Council of N.S.W., I recently thought I should visit their "lodge." It was a misty cold morning of poor visibility and I had come some four miles with a heavy ruck-sack. I climbed a few hundred tedious feet (being a fog-bound morning) and reached where my companion and myself had reckoned the building should be. So I stood! Hot after the exertion, but cold as the perspiration

froze on my bones. Do you think I could find that lodge? There was no sign. Quite suddenly, "faint as a figure seen at early dawn down at the far end of an avenue," I caught a glance of a straight, white line. I slipped down quickly and ran over the roof of the hut! It was completely buried in snow! Scour? No scour?

That hut should have been erected where the wind (not too strong) would have, year in and year out, swept the soft, flying snow away from its walls and doors. Instead, it had been erected in a sheltered spot, of some beauty, where the blown snow settled in drifts. It should have been located in a more exposed slope where the snow could have been blown past it.

Having selected a site where natural scouring may be expected, it is then essential that the plan of the building be simple, with few projections. Large projections create "dead" air, and where "dead" air exists the snow particles fall out of the windstream to form a snow deposit and, with an incorrect relationship between entrances and "dead" air pockets, the ultimate is that a building may become "snowed-in."

Building materials may be considered next. Here stone is nature's answer, but the use of stone in building is accompanied by so many disadvantages. It is such a pleasing material, so frigidly ductile, so workable to the scultor and so natural to the architect. But, if a building of stone in the snow is to be waterproof, it has to be laid in waterproof mortar and the walls must be rendered on the inside with mortar which has been made impervious to moisture by the addition of one of the proprietary compounds.

So we must look around for other things; but, before we do, do not forget that there is plenty of stone on the Southern Alps, though more in N.S.W. than Victoria.

Galvanised iron huts are no good. There is a hut on the main range, somewhat south of Brassy Mountain, called "Tin Hut." And isn't it? It is generally half covered with snow (due to this scour business, or lack of it) and is reputed to be the coldest building in N.S.W. [Next to Grey Mare?—D.M.R.]

The essential qualities of building material for alpine usage are:—

(1) Portability (lightness and durability).
(2) Thermal efficiency.
(3) Size of units and shape.
(4) Ease and simplicity of fixing.

In N.S.W. all materials have to be carried a long way. Even those purchased locally at Cooma have a sixty mile trip. In Victoria distances between supplies and site are less and costs proportionately lower.

Timber is easily acquired comparatively close to Victorian mountain sites, but in N.S.W. it has to be brought long distances; hardwoods from the North Coast and oregon and soft woods from Sydney. Nevertheless, timber remains the best of all materials for framework and structural members; and for external and internal sheeting its thermal properties are fair and its aesthetic value high. It is easy to handle, shape, cut and fit and easy to transport. It lends itself to a degree of prefabrication, but in this connection a special warning is warranted. If the parts of a building are pre-cut the assembly procedure must be absolutely foolproof, of the utmost simplicity and all parts should be clearly marked to ensure that they are correctly mated.

Among other factors, the builder in the snow is usually assisted by enthusiastic bands of voluntary club workers, not trained for the work to be undertaken and requiring special aids to success. Nor can the builder or his men always expect to be beyond reproach, and mistakes have been made in the erection of some of the ski lodges which could have been avoided by clearer marking of parts and clearer directions.

For external lining, timber can be used, vertically or horizontally laid on the framing. The beautiful lodge erected by the Telemark Ski Club is made of carefully fitted, rough-hewn logs with the joints caulked like a boat. Truly a log cabin, and a warm and comfortable one.

For internal lining waterproof plywood has its uses, though here some of the patented wallboard and compressed fibre materials with higher thermal efficiency are more popular.

Everywhere in the building special attention must be paid to damp-proofing and flashing. High winds are the order, with driven rain and the finest powder snow. If there was a test needed for non-weatherproof building, like the test for faults officials make with purple stain in our drains, it could be this insidious frozen powder which seems to find its way through the very glass of the windows, under and over doors, under

View from Blue Cow Mountan showing roadway to Guthega, Snowy River, Munyang Pipe Line, Munyang or Whites River, Disappointment Spur and Mt. Gungarten (6790 feet).
Photo. G. Petersen.

the laps of the roofing material, through joints of all kinds, behind flashings. Forced by the wind, it can move on the veriest zephyr, doing no harm until it melts and a little pool of water appears, and the stain on the ceiling remains.

I would say for calculating overlaps of flashings and rebates of all kinds, one should double the number first thought of. Every device known to the builder and the architects for weatherproofing should be critically examined before a problem is resolved. Cost is the ever-present drawback to many ideas; but it is truly surprising to find doors and windows placed in some buildings where the most elementary detailing has been badly handled, though much thought has been given to elaborate design elsewhere. Splay-rebated and throated bottom rails to sashes and doors should not be forgotten.

In Victoria, I visited a wel lplanned lodge in which some of the occupants could not understand why the well-puttied steel frame windows leaked. The excellence of the workmanship and finish was pointed out to me, but the putty was on the inside! The frames had been fitted inside out.

Thinking of water, leads to plumbing problems. These are increased in alpine buildings. Special thought must be given to the likelihood of water freezing with the consequent bursting of pipes and a good arrangement to prevent this is to have a drain on the whole system (if the building is a small one). Pipe runs should be as short and simple as possible and well wrapped with a thermal insulator. It has been found that if water is kept moving the chance of freezing is reduced so, where a running water supply from a creek or spring is available, water may be kept in circulation through an open end to the system to allow a small quantity to run away at all times during cold weather.

Where soil drainage has to be carried down externally, exposed pipes are unsatisfactory.

Some form of encasing to insulate from outside cold is necessary.

Hot water supply has its tricks, too. Do not overlook the fact that a heating unit designed to raise water at 68 deg. F. to, say, 112 deg. F., will not necessarily raise water near freezing point to the same degree of heat. I recall an occasion when there seemed to be nothing funnier to my friends than me shivering under a trickle of warm water delivered from an instantaneous kerosene heater that probably functioned most efficiently in Strathfield or Bondi, but could not cope with Kosciusko at 36 deg. F.

In small huts, a heater coil in the firebox of the cooking stove has been used with success. A semi-rotary pump to each shower working from a small central storage tank is simple and cheap. In the Alpine Hut at the foot of the Brassy Mountain this system is used to pump from a bucket placed nearby and filled from a central hot-water tank. There it was hailed as a great advance upon the original system of hoisting a perforated kerosene tin over one's head.

In larger buildings, catering for an occupancy of twenty people or more, good storage becomes essential and efficient heating equipment must be provided. Kerosene is the commonest kind of fuel, but, remember, it also has to be stored in bulk to be on tap through the winter months when normal transport ceases.

The vital part of all systems is the cock at the lowest point to permit draining and avoid the risk of freezing.

Roofs of buildings in the snow country give rise to some interesting thinking. Here are some of the points:—

1. They must not be so steep that they continuously throw the snow off all around, thereby blocking windows and doors.
2. They must not be so flat that trouble arises from the laps in covering materials, or expensive membrane construction is necessary.
3. Covering materials must be carefully and strongly fitted to ensure that they are not blown off and that they are snowproof.
4. Sarking under the covering with bituminous felt or boards is worth the expense involved in nearly every case.

A steeply pitched roof must be designed to withstand very high wind loadings and, whilst it may have a certain aesthetic value in some situations, even the most cultured aesthete is liable to forget beauty when a heavy dollop of wet snow is thrown on his head as he leaves a doorway. Flat pitches are to be recommended. Snow guards can be constructed along the edges. These will hold snow in position, but there is a special danger to be noted and guarded against. The small bank of snow retained along the edge sometimes freezes hard and forms a dam which will hold a pool of water and this may find its way through the lowermost joint or two in the covering material, damaging the eaves lining and even the ceiling within the building.

So far the best all-round covering material has been corrugated iron. Pressed metal tiles have been used with success where they have been carefully fitted. Aluminium sheet roofing should be good but expensive. Bituminous felt alone should not be trusted, largely because it is so rarely maintained correctly and, when forgotten, leaks soon develop.

There is another danger to be reckoned with, specially where no sarking material is used under the outer covering. This is the moisture formed on the underside by condensation caused by the warmth of the interior and the frozen outside. In a low pitch this will not run to the bottom of the slope and drips on to the ceiling. So simple when you remember it!

There is so much in this particular problem of snow buildings. Briefly, a few more special factors are:—

1. Orientation. Care must be taken to get plenty of sunlight in the living rooms; windows should command the view, if any. It is a great pleasure to relax and watch other people exerting themselves.

2. Warmth. Apply exhaustive thought to thermal insulation. Locate fireplaces on inside walls wherever possible. Plan all entrances to have airlocks, in the form of a porch with outer and inner doors, or an internal passage with a door at each end. A ski room with a work bench is absolutely necessary.

Finally, and again, remember scour. Consult others with local knowledge. The finest of waterproof buildings is not considered useful if skier, as well as water, cannot enter.