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UD 6-81-6 E

INSTRUCTION IN WINTER SERVICE BIOUVAC

English edition

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Instruction in Winter Service – Biouvac

Norwegian School of Winter Warfare
UD 6-81-2 E Instruction in Winter service
– Biouvac is appoved for use for
The Norwegian Armed Forces

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Sections

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1 INTRODUCTION

1.1 ADMINISTRATIVE REGULATIONS

1.1.1 Objective

1.1.1.1 The objective of Part 6 is to provide an introduction to the different types of bivouac and how to ensure that the best type of bivouac is utilised. This section only provides a brief introduction and must therefore be followed up with practical training in different types of terrain and conditions. Several elements are of a general nature and must be adapted to the procedures and equipment of the individual division.

1.1.2 Entry into force

1.1.2.1 UD 6-81-6 Instruction in Winter Service – Bivouac – came into force on 20th November 2009. At the same time, UD 6-81-6 Instruction in Winter Service – Bivouac – of November 1989 was withdrawn.

1.1.3 General

1.1.3.1 It is always the prevailing tactical situation that determines which type of bivouac should be utilised as well as its placement and how extensive the encampment should be. Nonetheless, the bivouac's importance increases during the wintertime. Great emphasis must be placed on the bivouac service if the respective divisions' battle capability is to be maintained. Military personnel must be prepared to take command of critical conditions. Certain soldiers or smaller groups may become detached from their division and must therefore be capable of surviving without bivouacking equipment. Weather conditions can also render tent erection impossible, even though the equipment is available. If soldiers practice how to confront such difficult situations during training, the possibility of continuing to carry out a mission and surviving will increase.

1.1.4 Types of bivouac

1.1.4.1 For the sake of simplicity, bivouac types can be divided into the various types of bivouac tent, as well as improvised bivouacs in the forest and high mountain.

1.1.5 Improvised bivouacs

1.1.5.1 Improvised bivouacs are made of materials found in nature, where the need for bivouacking arises. This type of bivouac is used when more suitable alternatives are not available, or where prevailing weather conditions do not permit the erection of tents. We differentiate between improvised bivouacs in the forest and improvised bivouacs in the high mountain as building materials and building methods differ.

1.1.6 Tents

1.1.6.1 A tent is more practical during combat movement, at base camps and during patrols. A tent offers several advantages:

- easy to carry
- easy to erect
- easy to camouflage
- easy to heat
- distribution of personnel

2 BIVOUACS

2.1 CHOICE OF BIVOUAC AREAS

2.1.1 General

2.1.1.1 The establishment of a good bivouac encampment already commences at the point when a mission is being planned. If possible, appropriate encampment areas should be identified on a map. Continuous identification of appropriate encampment areas should also take place during a mission insofar as these areas may be of use at a later stage of the mission.

Before establishing an encampment, the following points should be considered:

- Trail plan – you will have only ONE chance
- Shelter and cover (also from the air)
- Options to position sentries and close defence
- The encampment should not be in an avalanche risk area
- Sheltered from the prevailing wind direction

2.1.2 PRINCIPLES OF TENT USAGE

2.1.2.1 General

There are currently various solutions adopted by different military divisions: from cotton canvas tents to various types of dome tents and tunnel tents made from polyester and polyamide fabrics. Regardless of the type of tent, there are a number of common principles that should be adopted:

- Low height and minimal volume, to decrease the heating requirement
- Water repellent canvas that breathes and restricts water permeability and condensation as little as possible
- Windproof and wind stable
- Tight walls, to prevent the wind from ’pumping’ warm air out of the tent
- Lightproof
- Good ventilation options

2.1.2.2 Choice of tent encampment

The ideal tent encampment is characterised by the following:

- Sheltered from the prevailing wind direction
- Dry ground (not marshland, floodwater, etc)
- Flat or lightly sloping terrain
- Vegetation for camouflage and shelter
- Sufficient snow depth to construct a proper work pit

REMEMBER!

- The cold will often remain in the lower parts of the terrain. Set up the encampment ‘high but low’, i.e. at least five metres higher than cold zones such as water and marshland, but lower than windy summits.

2.1.2.3 Protection against the effects of weapons

Although certain types of ammunition are less effective in snow, the tent will not provide protection against the effects of weapons. Modern artillery and mortar grenades with proximity fuses represent a serious threat to a tent bivouac. To decrease the effect of hostile fire and to increase the likelihood of survival, the following measures should be observed:

- Dig the tent into the ground
- Construct a protection mound around the tent
- Use the surrounding terrain for protection

It is easier to dig the tent into deep snow. However, when little snow is present, the same effect can be achieved by building a mound around the tent. The thickness of the mound is dependent upon the snow’s consistency.

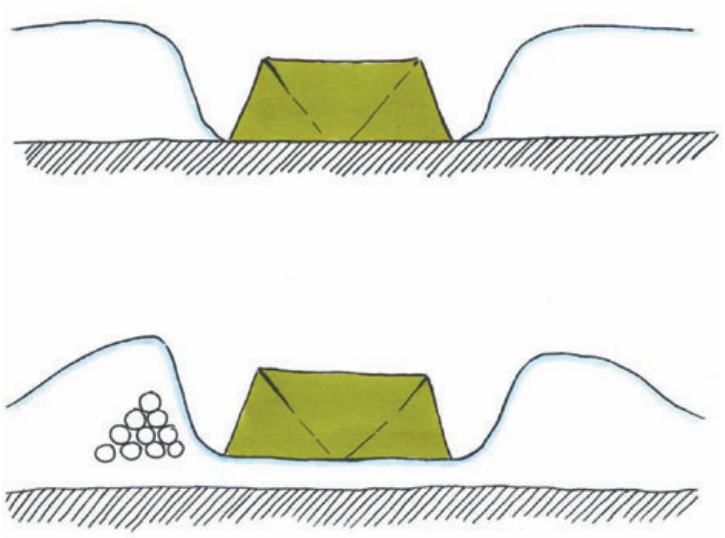

Figure 1

- *Completely buried tent*
- *Burying a tent*

NB!

- When the tent is buried or surrounded by mounds, it is easier for windswept snow to accumulate on the top and sides of the tent. This must be inspected and removed at frequent intervals.

2.1.2.4 Heating and temperature

There are various types of heat sources for the different types of tent bivouac. All heat sources have the same primary tasks:

- Melting snow and boiling water for food and drink
- Heating the tent

Use of the various types of burners and fuels is described for the individual type of burner and in UD 2-1. When melting snow and filling thermos flasks, daylight should be used as much as possible. The bivouac's signature will be considerably strengthened if this is carried out after nightfall.

If cooking apparatus is being used in the tent and a hand is raised towards the tent's roof, strong heat can be felt right under the roof. The heat will gradually diminish if the hand is lowered towards the groundsheet. It is important to achieve the highest possible temperature in the part of the tent in which personnel are either sitting or lying.

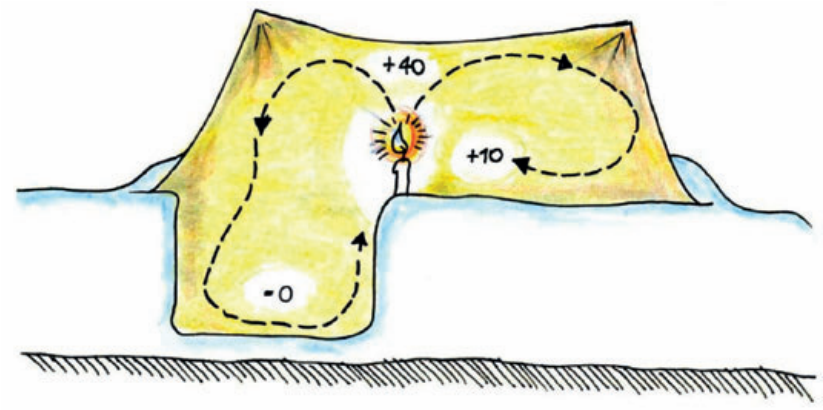

Figure 2 - Heat circulation in a tent

2.1.2.5 Work pit

If the tent is being erected on snow, a higher temperature can be achieved in the area in which personnel are lying by digging a work pit. A work pit is a sunken area 60-80 cm deep, situated at the entrance to the tent. The work pit provides the following options:

- Correct placement of a heat source. The heat source makes less noise and is more difficult to detect with thermal observation equipment. The risk of fire is also diminished
- Standing work area for personnel responsible for the preparation of food and drink
- Excavation of recesses for the storage of supplies, paraffin, etc, when the snow has 'set'

NB!

- The tent should be organised into one clean and one dirty side
- A fire watch should be on duty when a heat source is being used

2.1.2.6 Insulation

Snow insulates well against cold from the ground (frost). In addition, a groundsheet offers good insulation from the cold.

To achieve the best possible level of insulation in the tent, the following measures should be observed:

- Place sprigs or birch on top of the snow to create an air pocket between the snow and the groundsheet
- Ensure that the groundsheet overlaps in such a way that openings in the tent floor are avoided
- Place snow on the external walls of the tent/storm mats so that the wind has no noticeable effect.

NB!

- Remember to place twigs on the tent walls before adding snow otherwise the canvas will freeze to the snow

- Use a double top canvas for tents
- Use storm buttoning in the side walls of tents
- Use storm mats in mountain tents

Figure 3 - Storm mats on a mountain tent

Figure 4 - Windbreak

2.1.2.7 Windbreaks

When erecting a tent in high mountain terrain or in locations exposed to wind, a windbreak or 'wind plough' should be constructed around the tent. (A wind plough is a method whereby the wind is used to help establish a steep snowdrift to protect the tent.) This applies to all types of tent. The purpose of this is to prevent the wind from taking hold of the tent, as well as preventing a build up of snow on the tent, insofar as the windbreak creates a 'snow-free zone' on the lee-side. The tent should also be dug down in high mountain terrain, if the tactical situation requires this. However, due to the wind, the tent should not be dug down more than halfway because of the risk of it becoming buried.

The windbreak should be constructed around the whole tent as the wind direction can quickly change. In the case of extreme wind, a wind plough may be used in addition to a windbreak.

REMEMBER!

- The wind plough's height should be one half of the height of the tent
- The windbreak should be constructed on the side of the tent that faces the wind
- The wind plough should be erected at a distance of around 4 metres for wind speeds of under 15 m/s and 8 metres for wind speeds above 15 m/s
- Remove snow and maintain the windbreak during periods of heavy wind and snow

The construction of windbreaks and wind ploughs places a heavy demand on resources and must therefore be prioritised in relation to the tactical situation, the terrain in which the encampment is to be located, the expected weather conditions and wind direction, as well as the length of time that the encampment will be in place.

Prioritisation should be as follows:

- Windbreaks or wind ploughs should only be constructed on the side of the tent that is facing the wind.
- A windbreak surrounding the whole tent. For longer periods of encampment and where changing wind directions are anticipated.
- Windbreak and wind plough. When extreme winds are anticipated.

3 ROUTINES FOR THE ERECTION OF A BIVOUAC

3.1 GENERAL

When erecting a winter bivouac it is vital that the unit has well established routines. This is particularly important during winter, when the consequences of forgetfulness or negligence can be extremely serious. Good routines should already be in place before attempting to erect a bivouac. This is facilitated through sensible packing before the mission commences.

- Has the correct materiel been packed?
- Are spades working properly?
- Has a test burning of heat sources been carried out?
- Has fuel been checked (type and quality)?
- Have tents with guy ropes, pegs, etc, been checked, where applicable?
- Is materiel that is to be used first easily accessible?
- Have work tasks been assigned in connection with the erection of the bivouac?

3.1.1 SNOW FOR MELTING

3.1.1.1 Snow for melting One of the first tasks to be undertaken when entering a bivouac area is the collection of snow for melting. This should be collected in clean snow bags, before the snow in the area becomes contaminated. It is of vital importance that clean bags are used for this purpose. The snow that is most palatable and which has the highest water content is found closest to the ground, not on the surface.

3.1.2 URINE SOAKAGE PIT

3.1.2.1 Identify and designate a location where all personnel may urinate. The pit should be marked with a stick, twigs or lumps of snow so that it may always be easily found and to also prevent snow from being taken from the site for drinking and eating purposes. Remember that, in some cases, a urine soakage pit can be detected with thermal imaging equipment. The pit should therefore be covered after use. If possible, camouflage the urine soakage pit by using a hollow, or by covering it with snow.

3.1.3 WEAPON STORAGE

3.1.3.1 As a general rule, personal weapons should always be at hand. If the tactical and safety situation permits, weapons may be placed outside, providing they are protected from extreme weather and wind. A weapon placed outside that is well protected will be best suited to withstanding variations in temperature. During peacetime, weapons that are stored outside should be guarded. Tent canvas or a camouflage cover for a backpack may be used as protection on top of and around weapons. In the case of bivouac encampments over a longer period of time, a weapon rack with a screen roof and walls may be built. This could be combined with a storage area for pulk sleds and divisional equipment. The roof and walls may be

constructed from logs, sprigs, twigs and blocks of snow.

3.1.4 STORAGE OF MATERIEL

3.1.4.1 As little materiel as possible should be taken into the bivouac. Materiel that needs to be taken into the bivouac encampment after it has been erected should be tightly packed and as accessible as possible. Remaining personal and section materiel should be stored outside of the bivouac. Such materiel should be buried in a pit. This will provide an effective degree of camouflage and will also decrease the possibility of materiel being blown away.

Pulk sleds are often used for storing divisional equipment and weapons. These should therefore be placed on a surface of logs, twigs or ski poles, which will prevent dampness (if the pulk sled is made of wood) and also prevent the pulk sled from freezing to the snow. Shafts, buckles and hooks must not be placed on a snow surface as these will become cold, making them difficult to work with later on. Belts and hauling ropes should be stored in the pulk sled. The pulk sled should be buried in a pit or a snow hole, which will also provide additional space for extra divisional equipment. Tent canvas or a tarpaulin may be attached to the front of the opening to prevent snow and sleet from blowing into the hollow.

NB!

- Always close the pulk sled after use. If it is left open, it will fill with snow.

3.1.5 ERECTION OF LATRINES

3.1.5.1 Use either a sunken pit or a BioToi (during peacetime exercises). In the case of a bivouac encampment that is only being used for a short period, a pit latrine dug into the snow will suffice. Even in wintertime it is possible to dig pit latrines in the ground. Knowledge of where the least amount of frost is situated is necessary in order to save time and energy. Suitable areas are:

- in hollows containing much snow
- bare forest floor containing plenty of moss
- within alder thickets and on scrubland
- on marshland

Latrines should be screened by:

- a snow mound
- long sticks, twigs or sprigs
- tent canvas or a tarpaulin

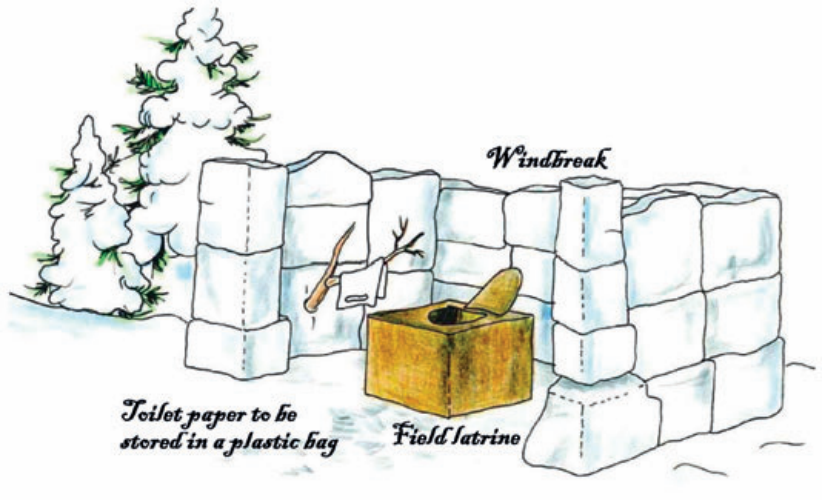

Figure 5 - Latrine

3.1.6 TRAIL PLAN

3.1.6.1 In order for the division to remain as well camouflaged as possible, it is important to establish a trail plan. A plan should already have been worked out before arrival at the area in which the bivouac encampment is to be established.

Map reconnaissance should take place well before arrival at the particular base camp area. Areas should be identified that provide the best possible shelter (including covering tracks), cover and detour options, as well as the possibility of leaving false trails.

In advance of the main force, a reconnaissance and trail patrol of the particular area should be carried out. This must be far-sighted and disciplined in relation to the course of the division. The reconnaissance should include:

- The bivouac encampment area
- Detour point
- Close defence positions and sentry positions
- Additional false trails and dummy positions

When the reconnaissance has been completed, a member of personnel should be sent back to guide the main force into the area. In this way, the main force will be prevented from leaving unnecessary traces. Upon entering the bivouac area, the main force should create the false trail and dummy positions before making a detour to the bivouac area.

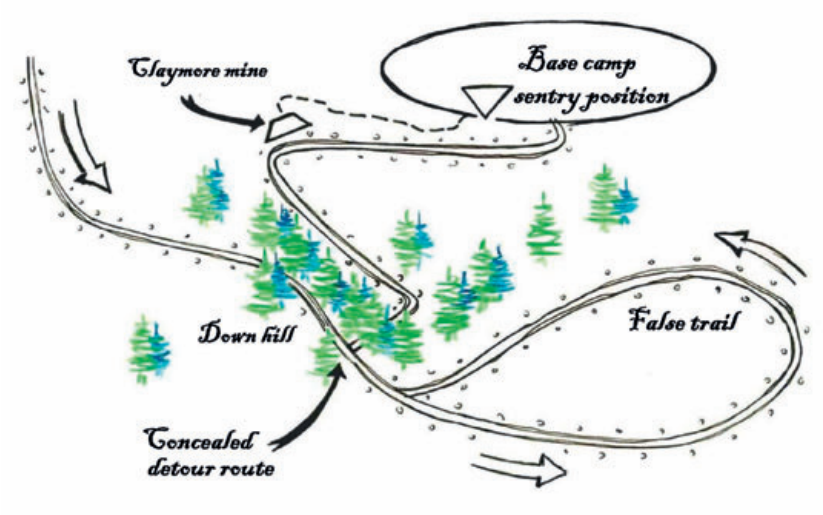

Figure 6- Trail plan drawing

Remember!
- The detour route should be downhill
- The detour route should be concealed and must be camouflaged
- The sentry position must have visual control of the 'fishing hook' leading into the base camp area
- It should not be possible to observe the 'fishing hook' from the false trail
- The false trail must contain the same number of tracks as the main trail
- Sector charges should cover the 'fishing hook'

3.1.7 PRACTICAL ADVICE

3.1.7.1 Activity and Detailed explanation

During movements

Prepare and organise a trail patrol and reconnaissance group. Melt as much snow as possible during daylight hours.

Security posts

Establish security posts and test positions in relation to the perceived threat. Closure of detour route.

Adjust clothing

After a long march, soldiers are often tired and perspiring when they enter a bivouac

encampment. If they are standing around and freezing without being assigned to any tasks, they expose themselves to the risk of frostbite. It is therefore important that clothing is adjusted and that bivouac erection commences as soon as possible once the position has been occupied.

Inspection of materiel

Designate a materiel administrator When snowfall and snowdrifts have occurred, inspection of materiel is important. All equipment should be stored in one location. Pack all equipment tightly together to prevent disorder and loss of materiel.

Work distribution

Digging, erection of tents, windbreaks, collection of water, birch and sprigs, melting of snow, sentry change, etc, – ALL hands at work!

Erection of tents

Trample the ground on which the bivouac is to be sited and allow it to 'settle' for around 10-15 minutes. The entrance to the tent should be hidden from the enemy's view and preferably face away from the wind. Brace well. Throw sufficient quantities of snow onto the edge of the tent, having first placed birch or sprigs along the edge (or on top of the storm mats). Camouflaging.

Work pit

A work pit should excavated. Snow from the work pit can be divided into sitting/lying surfaces. The edges of the work pit may be strengthened with long sticks.

Insulate from the ground

Sprigs or birch should be distributed around the sleeping surface before base mats are put in place, in order to improve ground insulation (when using a canvas tent). Following this, base mats are placed on top and kit bags are placed in fixed positions at the head end. In order to increase efficiency, groundsheets must overlap.

Fire watch

In a tent in which a heat source is being used, knives or bayonets should be present and placed appropriately in order to be used in any cutting of the tent canvas in the event of a fire. Water bottles should also be on standby in order to extinguish any fire. The fire watch must be wearing shoes, must remain outside of the sleeping bag and must be in full control of the heat source at any given time.

Removal of snow

Before climbing into the tent, snow must be removed from feet, clothing and equipment with a clothes brush. Do not permit snow to enter the bivouac. It will turn into water almost immediately.

Food and drink

Ensure that everyone has received a sufficient amount of food and drink.

Maintenance

The bivouac must be maintained on a continual basis. Camouflage and snow must be removed from the roof and walls. Repair of windbreaks. Any air vents should be kept open (snow holes/pits).

Inspection and follow-up

The officer in charge of the tent or unit must carry out an examination of all personnel in the bivouac. Examination of general well-being and cold/frostbite injuries Weapon inspection and maintenance of other critical materiel. Remember to replace and inspect personnel on sentry duty or personnel who are carrying out other duties outside. Trust is good – inspection is best!

4 ENCAMPMENT ACCOMMODATIONS

4.1 CANVAS TENTS

4.1.1 General

4.1.1.1 The tent canvas section, together with poles and pegs, constitutes our one-man tent equipment. The rhombus-shaped canvas can be buttoned together in an unlimited number of combinations. The four most practical solutions are:

- 3 piece tent
- 5 piece tent
- 7 piece tent
- 10 piece tent

4.1.2 Buttoning

4.1.2.1 For individual tents, a pattern for buttoning the canvas sections is shown below. It is important to note that canvas sections with a lower designated number should be buttoned outside sections with a higher designated number. Also, the openings in the canvas sections should be facing the correct way (roofing tile principle). The guy fastenings are marked with a black dot. The canvas tent can be buttoned in two ways:

- storm buttoning
- double buttoning

Storm buttoning creates a tighter tent than double buttoning. Storm buttoning should therefore only be used on side walls and not on the roof due to the risk of carbon monoxide poisoning resulting from the use of cooking apparatus. Usually, the whole tent is buttoned together before being erected. In extremely cold conditions or when the canvas has stiffened as a result of frost, the buttoning and erection of the tent may be carried out in the following way:

- only button together the corners of the tent canvas
- the tent is erected
- cooking apparatus is placed beneath the canvas sections
- in the heat emanating from the cooking apparatus, the tent is buttoned from the inside
- the tent should be tightened again when buttoning has been completed

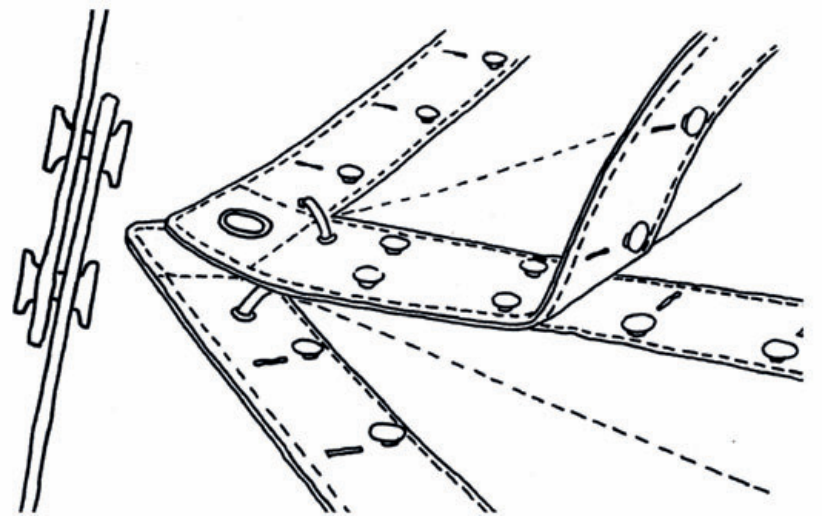

Figure 7 - Double buttoning

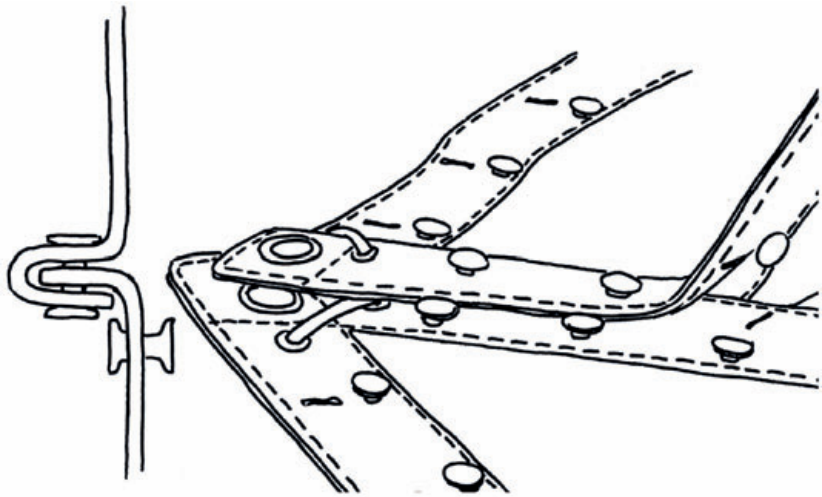

Figure 8 - Storm buttoning

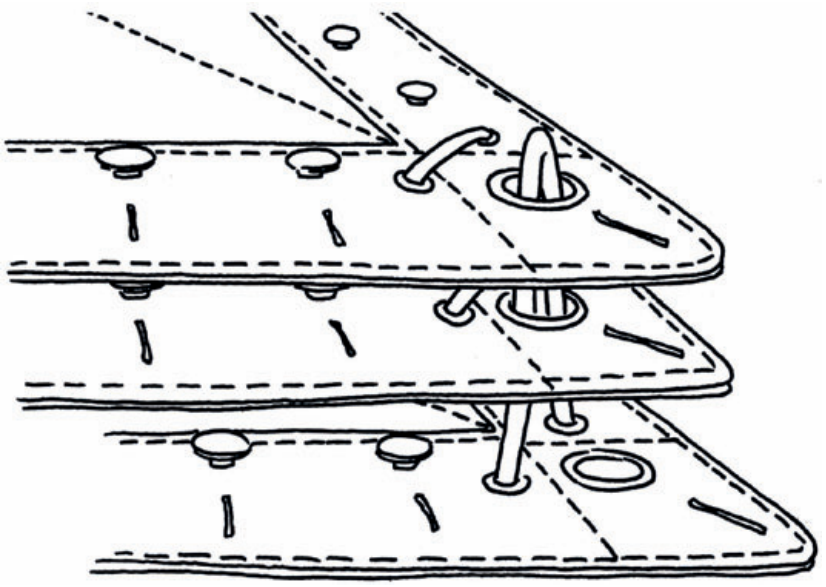

Figure 9 - Connection of canvas sections for guy ropes and pegs

When several canvas sections are joined together (to fasten guy ropes or for pegging), the loop on the innermost section should first be threaded through the ring on section no. 2, etc.

4.1.3 3 piece tent

4.1.3.1 The tent can sleep two persons (OP, patrols, etc). The tent requires only two guy ropes fastened to trees or long sticks. Proper tension at the tent's two main corners is vital to ensure a tight tent.

Figure 10 - 3 piece tent

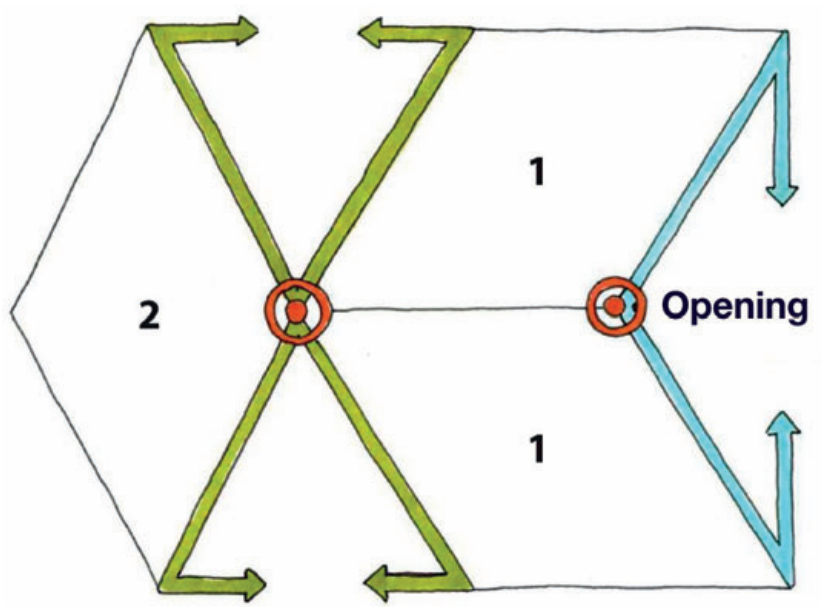

Figure 11 - Arrangement of a 3 piece tent

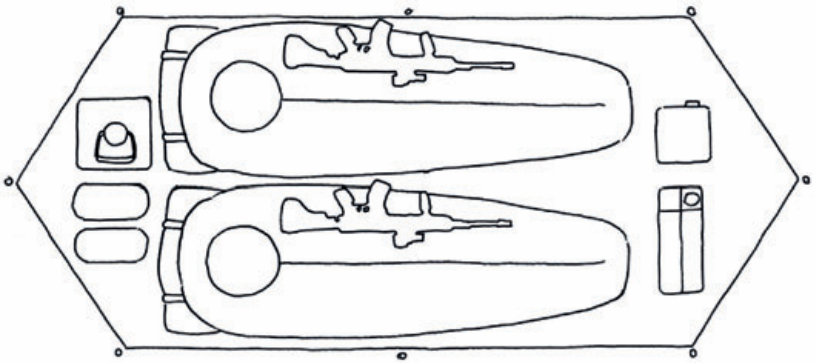

Figure 12 - Layout in a 3 piece tent

4.1.4 5 piece tent

4.1.4.1 A 5 piece tent is well suited to units of less than section size (OP, patrols, etc). The tent is more dependant on a level surface than a 7 piece tent, for example. A 5 piece tent with well stretched walls will be higher than desirable, in respect of energy utilisation.

Figure 13 - 5 piece tent

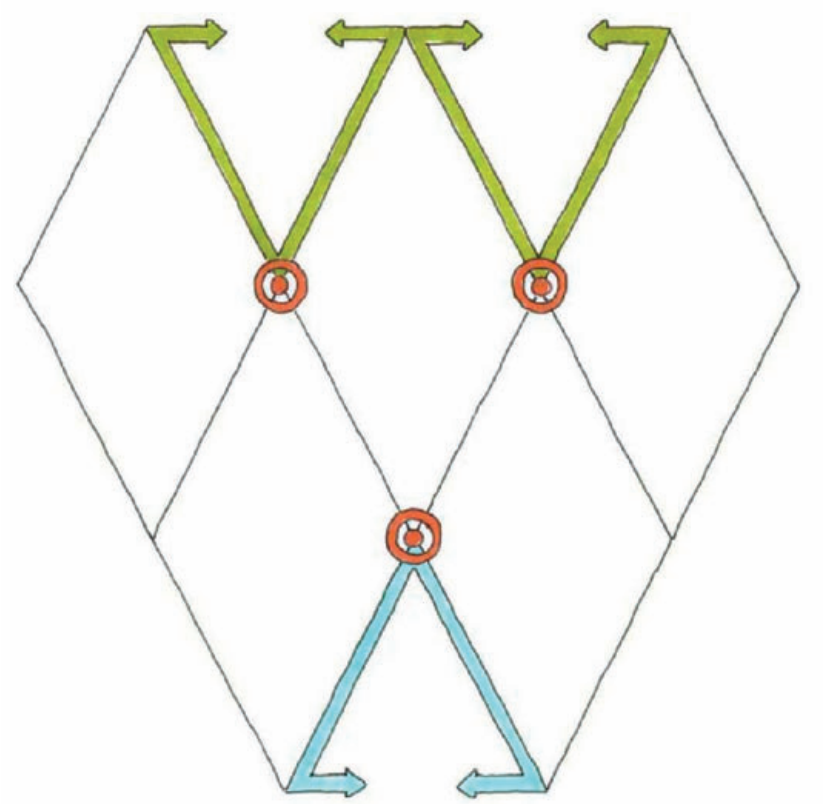

Figure 14 - Pattern for buttoning a 5 piece tent

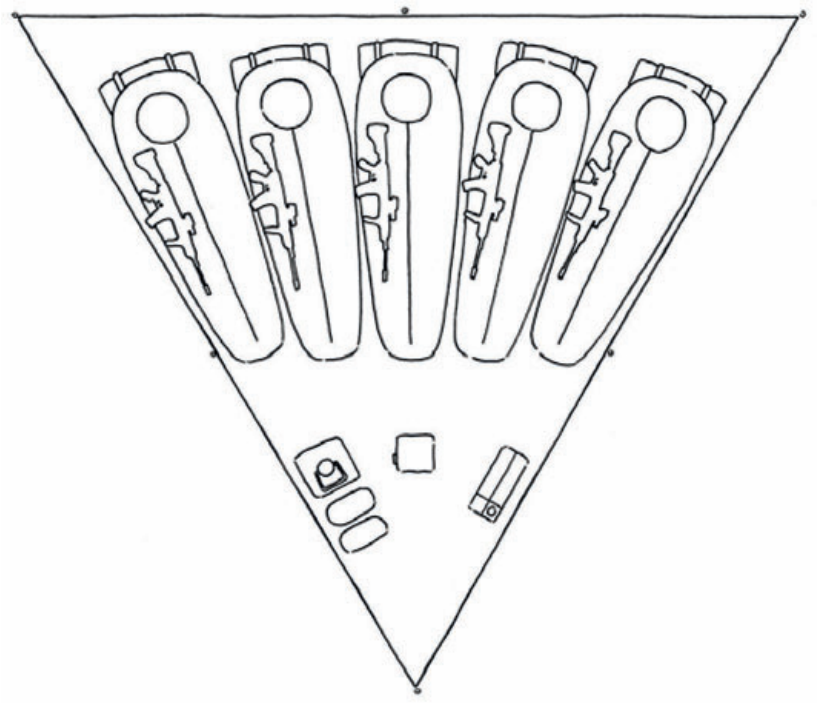

Figure 15 - Tent opening

Arrangement of a 5 piece tent

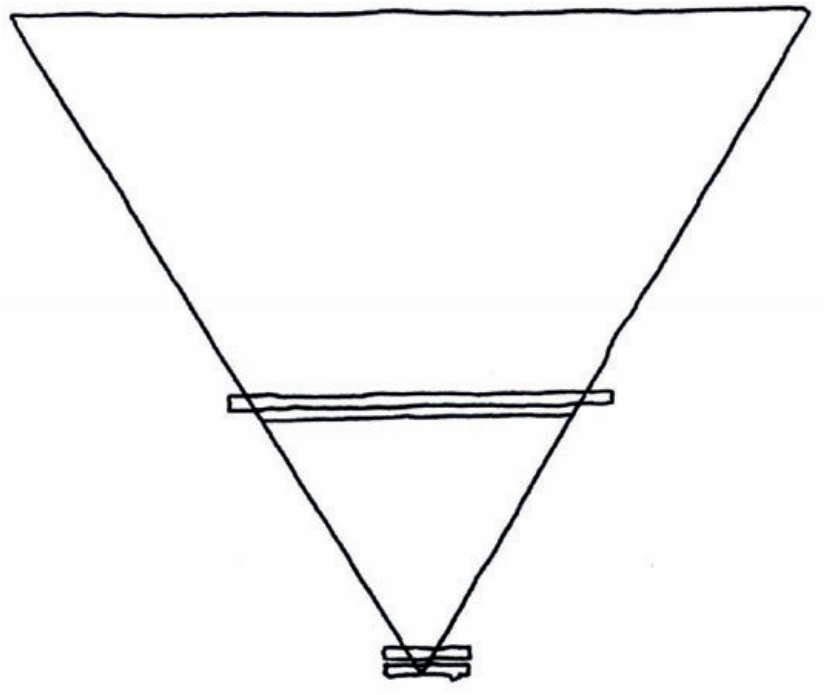

Figure 16 - Work pit in a 5 piece tent

4.1.5 7 piece tent

4.1.5.1 The best bivouac solution is a 7 piece tent, which has relatively good space for a section (7-8 persons) and is easy to erect and maintain. The tent is flexible and provides an adequate bivouac in lightly undulating terrain too. Neither is it dependent on a fixed roof height in order to permit the walls to be stretched. The tent may be buttoned, either with or without a twisted top canvas. A twisted top canvas will usually achieve better utilisation of available sleeping positions within the tent.

Figure 17 - 7 piece tent

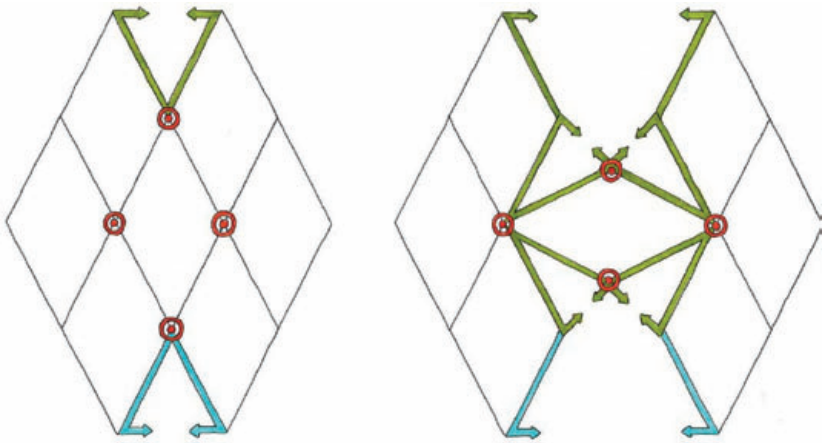

Figure 18 - Pattern for buttoning a 7piece tent

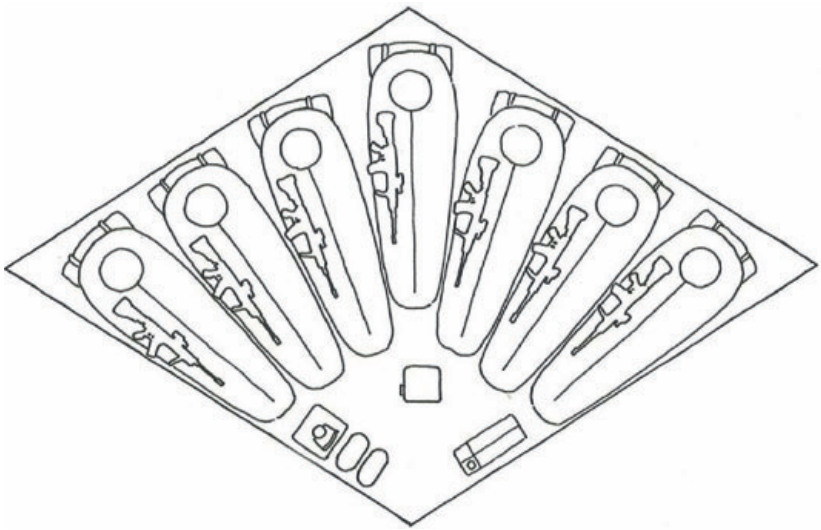

Figure 19 - Tent opening

Arrangement of a 7 piece tent with twisted top canvas

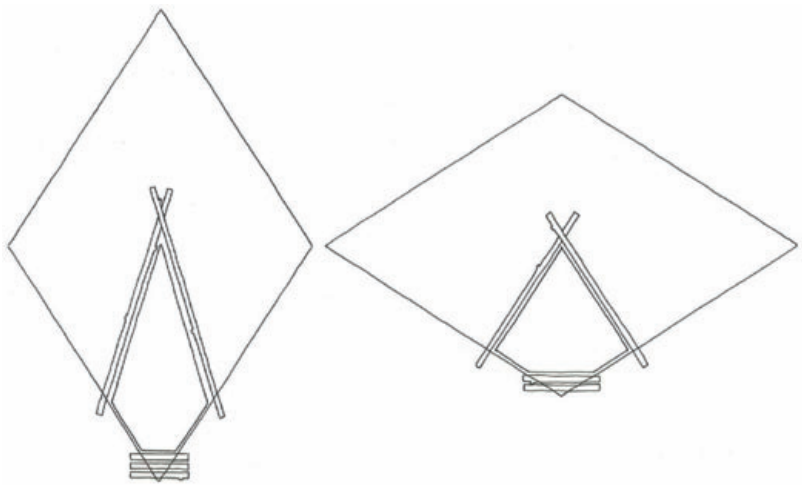

Figure 20 - Work pit in a 7 piece tent

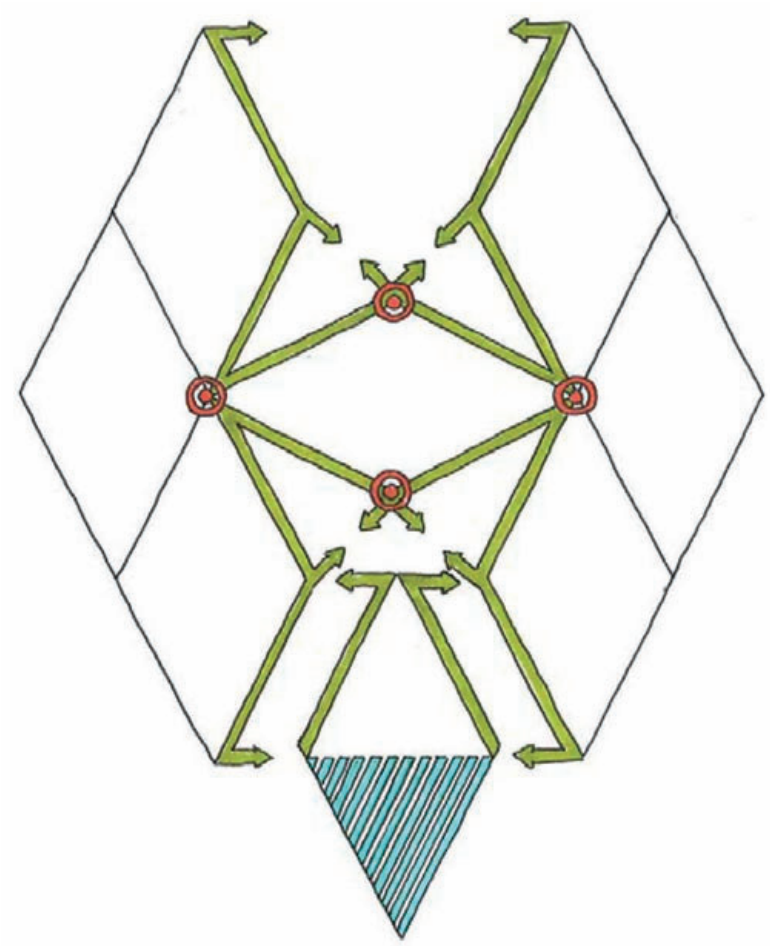

Figure 21 - Buttoning a 7 piece tent with reserve canvas section as a light lock

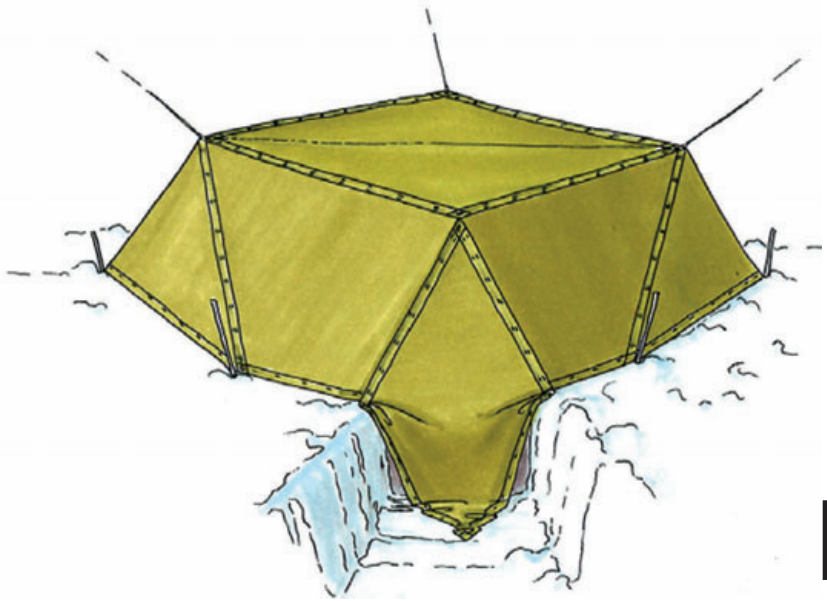

Figure 22 - 7 piece tent with reserve canvas section as a light lock

The following advantages may be gained by buttoning an extra canvas section to the tent's opening:

- good light protection
- minimal loss of heat
- easy entrance and exit
- efficient cold pit that is easy to construct
- greater available surface area

4.1.6 10 piece tent

4.1.6.1 The tent is suited to divisions above section size, (platoon command post, rifle units + canon units, etc). The erection of the tent follows the same principles as a 7 piece tent. The tent is flexible and provides an adequate bivouac in lightly undulating terrain, too. Neither is it dependent on a fixed roof height in order to permit the walls to be stretched. The tent's weakest point is the large roof surface that requires extra guy ropes and extra top canvas or plastic in poor weather.

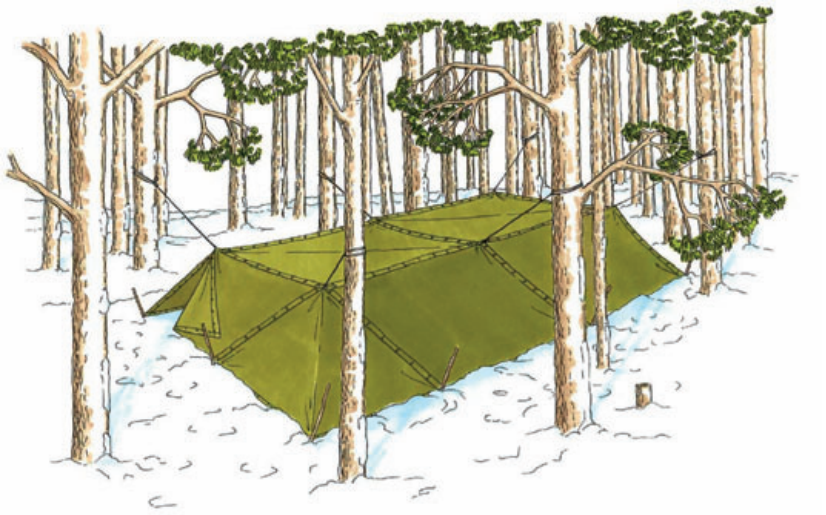

Figure 23 - 10 piece tent

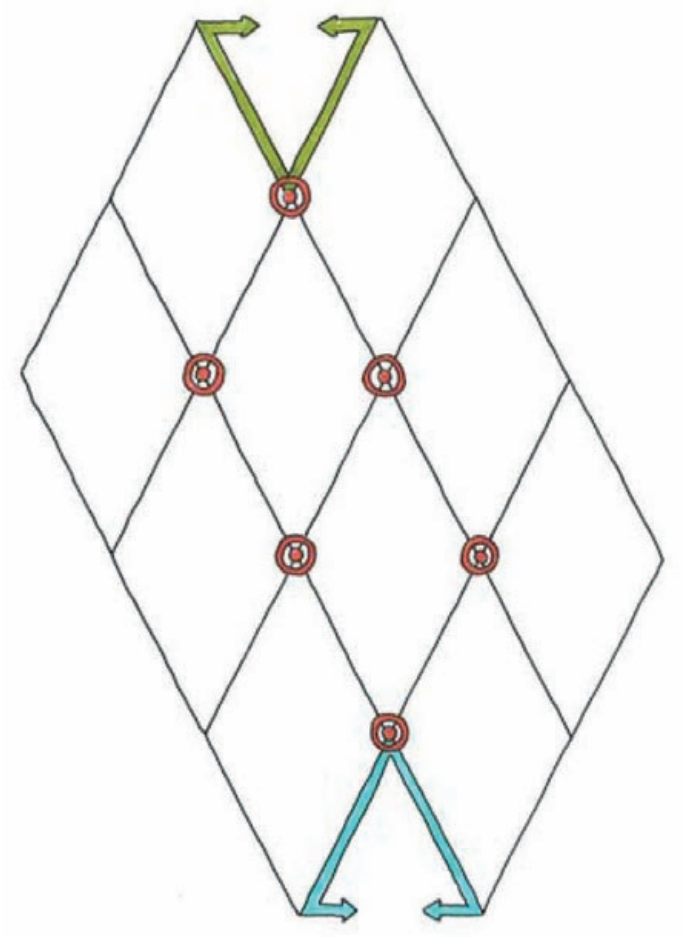

Figure 24 - Pattern for buttoning a 10 piece tent

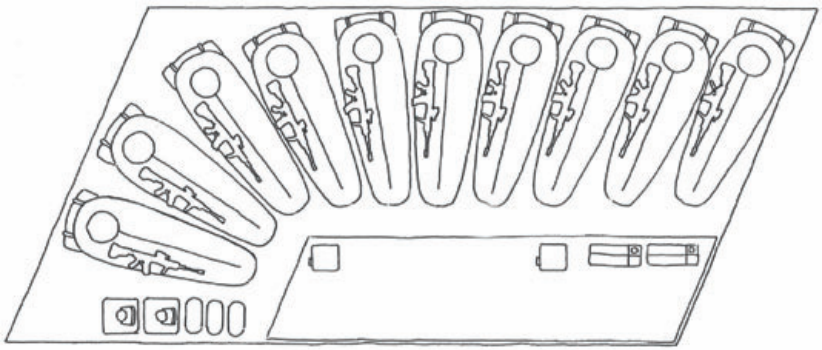

Figure 25 - Arrangement of a 10 piece tent

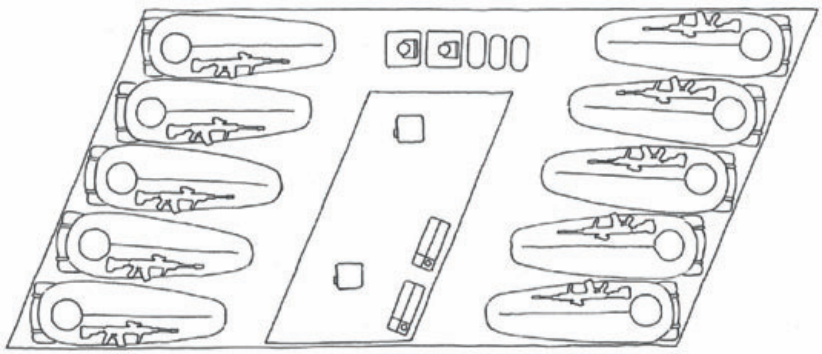

Figure 26 - Alternative arrangement of a 10 piece tent

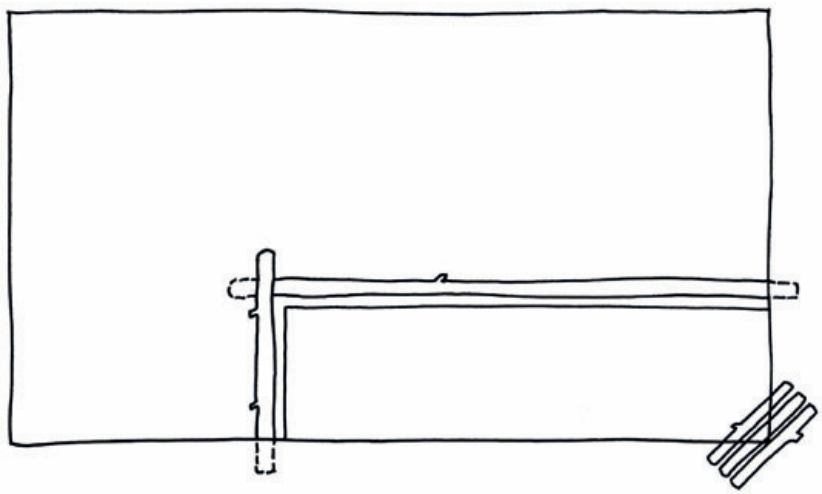

Figure 27 - Work pit in a 10 piece tent

4.1.6.2 Erection of a canvas tent

After the tent has been buttoned, attach the guy ropes to the guy rope fastenings. In order to quickly dissemble the tent, a loop knot is used. When using nylon rope, a stick may be inserted through the loop to prevent the knot from becoming undone.

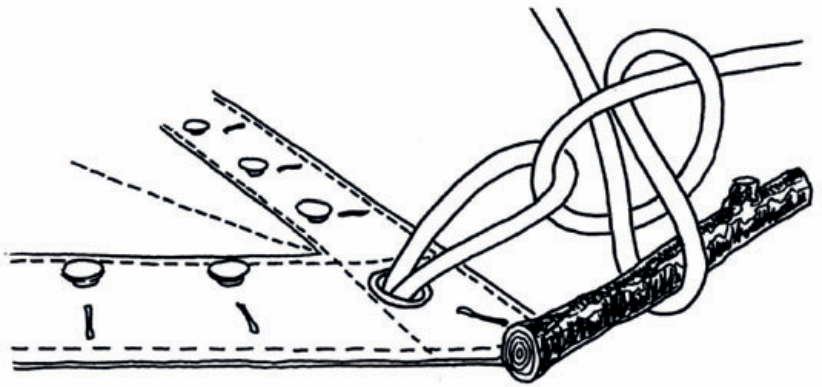

Figure 28 - Loop knot with 'security'

Tree branches, tent poles or, if nothing else is available, ski poles, may also be used

to support the tent canvas, particularly in the case of large tents. The more branches there are inside the tent, the more difficult it is to maintain good order. The use of such items inside the tent should therefore be restricted. If required, tent poles may be used as candlestick holders.

4.1.6.3 Erection of tent

The erection of a tent is achieved by hanging up the corners so that that top canvas is at chest height. Guy ropes should be attached to bushes and trees where possible. In addition, long sticks may be used to erect the tent. When the tent is erected, stretch out and peg the main corners simultaneously. The middle corners should then be stretched out and pegged.

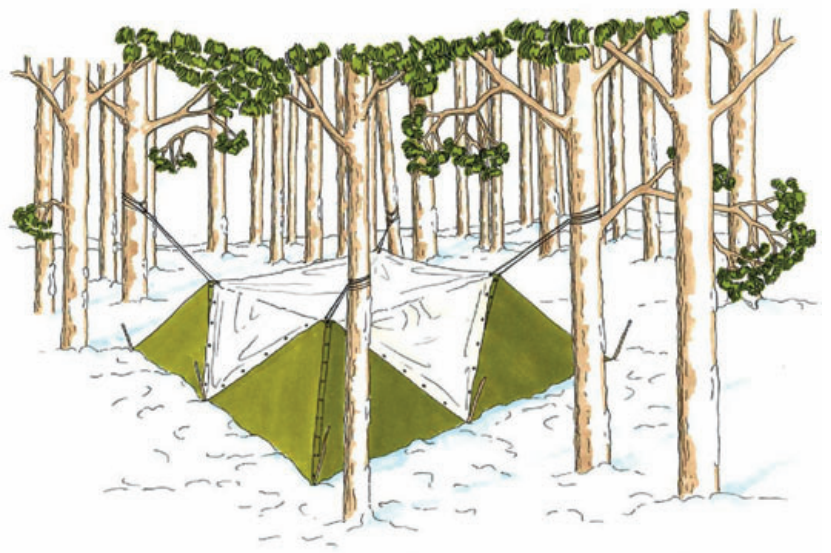

Figure 29 - Use of trees

In damp weather, a tarpaulin may be used to ensure that the tent remains dry. This may be placed between the top canvas sections or placed over the tent as a roof. The tarpaulin must be secured to the ground with plugs and with a rope to the guy ropes.

An extra line may also be used to the centre of the top canvas section.

After the cold pit has been constructed cf. description of the individual tent type, cooking apparatus should be placed on a cane grid in the inner corner of the cold pit, or should be placed down in the pit itself. Supplies and footwear (NB! Max 50°C) may be thawed and dried on the cane grid when the cooking apparatus has been placed in the cold pit. In addition, the noise and light from the cooking apparatus will be reduced.

A tree branch is useful for drying socks, mittens, boots, etc.

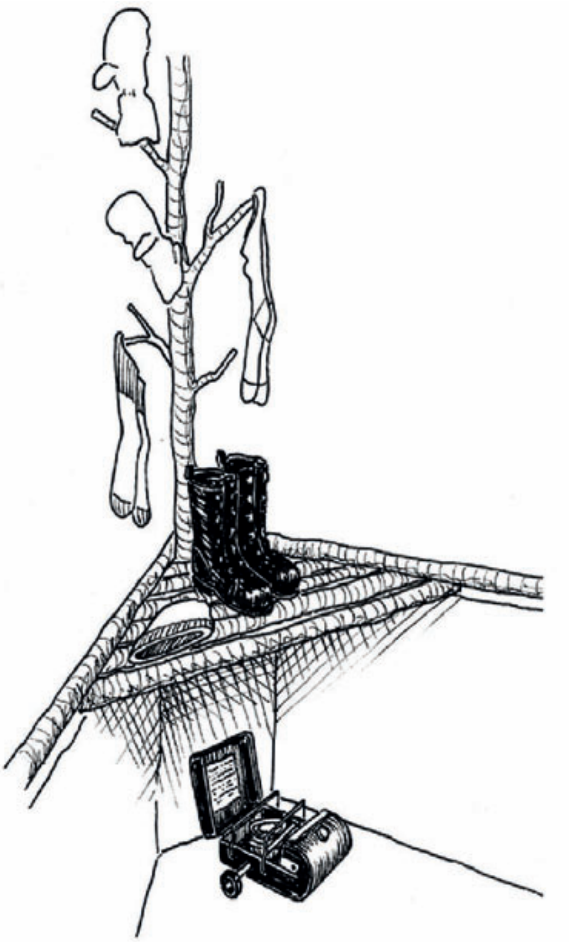

Figure 30 - Placement of cooking apparatus

Tree branches, tent poles or, if nothing else is available, ski poles, may also be used to support the tent canvas, particularly in the case of large tents. The more branches there are inside the tent, the more difficult it is to maintain good order. The use of such items inside the tent should therefore be restricted. If required, tent poles may be used as candlestick holders.

4.1.7 Drill for erection of tent

4.1.7.1 A canvas tent may be erected as a complete bivouac or as a quick bivouac. A complete bivouac can be used for all types of tent and is utilised when the tent is required for rest or drying, and until a splinter-proof dugout has been built. Only canvas tents and patrol tents are used as quick bivouacs and may be erected when:

- the division intends to eat during movement
- the advance is halted and personnel must be kept warm in order for battle capability to be maintained
- imminent combat is anticipated
- it is necessary to look after patients prior to evacuation

4.1.7.2 A quick bivouac is erected as follows:

- Security posts are assigned (if necessary, firing positions for the whole unit should be designated)
- Kitbags should be placed at the point where the tent is to be positioned
- The tent site should be trampled flat
- Buttoning/preparation of tent
- The tent should be hung up in trees or on skis or long sticks

Implementation with tasks divided among the force.

- Personnel are ordered in and sit on their kitbags
- Cooking apparatus is ignited and snow-melting is carried out in tandem with the erection of the tent

The bivouac should be ready in 5-10 minutes and disassembly should take 3-5 minutes from when the order has been issued. Thus, the division may enter the bivouac with a high degree of march preparedness.

4.1.7.3 A complete bivouac is erected as follows:

- Security posts/sentry posts are assigned
- Kitbags and other equipment should be placed in proximity to the point where the tent is to be positioned
- A change of clothing may be ordered if required
- Position occupation/position work
- The tent site is excavated or trampled down
- Cooking apparatus is ignited and snow-melting is carried out in tandem with the erection of the tent
- The tent is buttoned/made ready
- Long sticks, pegs, birch or sprigs are chopped
- The tent is erected
- A cold pit is excavated (snow from the cold pit is divided into sitting/lying

surfaces)

- Long sticks, twigs (or initially skis) are used to brace the edges of the cold pit
- Sprigs or birch is distributed, base mats are laid out, and kitbags are placed in fixed positions at the head end
- Sprigs and snow are placed on the edge of the tent canvas in order to prevent a draught
- A pit, snow hole or stand for weapons is built
- Pits for skis, snowshoes, materiel, latrines and urine are excavated
- A protection mound or windbreak is constructed

The officer in charge will usually split duties into three, according to local conditions.

Ovenstående driller er retningsgivende. I de fleste tilfeller vil annen virksomhet (for eksempel stillingsarbeider) medføre at bare en del av laget kan etablere bivuakken. Det viktigste er at vi ikke taper tid, og at alle tar del i arbeidet. Derfor må sjefen ha oversikt, slik at han kan fordele eller omfordele personellet på nye arbeidsoppgaver etter hvert.

4.1.8 Precautionary measures in the use of cooking/heating apparatus

4.1.8.1 A cooking apparatus produces carbon monoxide (CO), a highly toxic gas that is tasteless, odourless and colourless. CO production increases considerably with insufficient combustion (yellow flame). A yellow flame occurs most frequently when a cold kettle is placed on the cooking apparatus, or the apparatus is not working optimally.

PAY GREAT ATTENTION TO THIS!

In order to reduce the risk of carbon monoxide poisoning, sufficient ventilation must be achieved. A completely ice-covered or snow-covered tent could be compared to an airtight room. Therefore, the tent must be frequently cleared of snow and ice.

CARBON MONOXIDE POISONING:

- There are few symptoms and they are mild
- the advance is halted and personnel must be kept warm in order for battle capability to be maintained
- Headache and nausea
- Anyone can lose consciousness without prior warning
- The gas is heavier than air. Personnel lying down will be affected first
- Stearine candles are NO indication of the amount of carbon monoxide in the air

For supplementary provisions, refer to UD 2-1, Safety Provisions for the Norwegian Armed Forces.

4.2 UNIT TENT

4.2.1 General

4.2.1.1 A unit tent sleeps 8-10 persons. Due to its weight and volume, as well as the difficulty of concealing such a tent, it should not be used in forward positions.

Figure 31- Unit tent

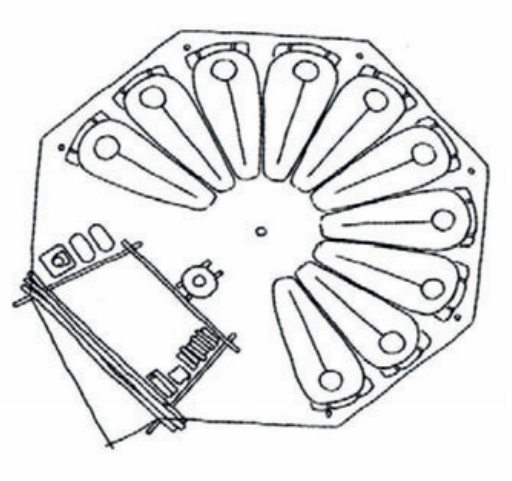

Figure 32

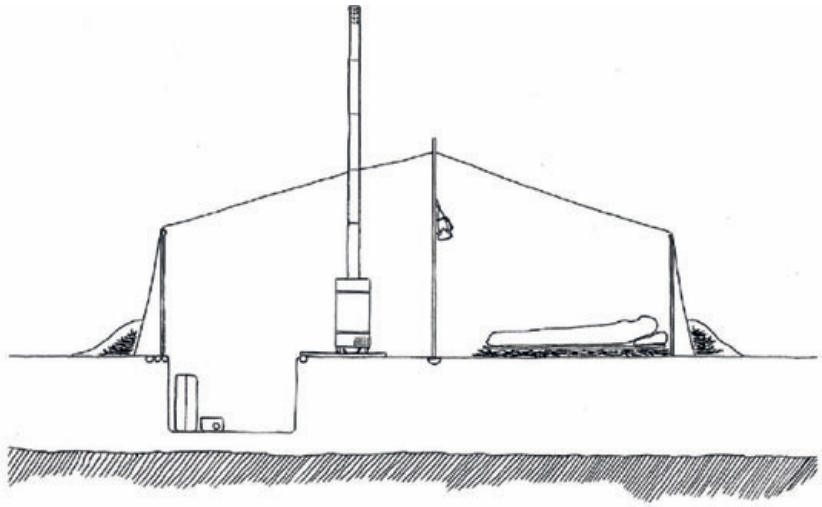

Figure 33 - Organisation and work pit in a unit tent, including a unit tent with M-94 camp stove

4.2.1.2 A unit tent sleeps 8-10 persons. Due to its weight and volume, as well as the difficulty of concealing such a tent, it should not be used in forward positions.

4.2.2 Measuring rope

4.2.2.1 For a fast and efficient tent erection, a measuring rope can be made. A tent may be easily erected by one person through the use of a measuring rope. The rope provides two measurements:

- Peg radius – 233 cm
- Peg distance – 178 cm
- Be accurate with these measurements!

4.2.3 Erection of tent

4.2.3.1 Attach a peg to the middle of the tent site. After this, affix the rope to the middle peg, stretch the rope and attach the pegs as indicated in the figure.

Continue around all eight corner pegs. The distance between the 7th and 8th pegs should be checked. If it is not correct, the pegs must be adjusted accordingly. Lay out the tent between the pegs and hook the tent's peg rings onto the corner pegs.

Another method that is efficient, though not as accurate, is to first attach 4 of the corners in a square, (every other peg), followed by the other corners. NB! The tent’s opening must then be buttoned up. The diagonal distance between the pegs should be around the same as the guy rope fastenings on the roof.

The central pole is joined together and inserted into the top housing. The central pole

must be placed on a fixed surface (bench or similar) to avoid sinking into the snow. The door pole is joined together, the butt end inserted into the sleeve in the tent's roof at the door opening and the pointed end inserted into the designated housing on the ground. The remaining side poles should then be put in place.

The guy rope pegs should be hammered into the ground 110 cm diagonally out from the corner pegs. The guy ropes are hooked and tightened.

The camp stove is placed on a base in the snow. Long sticks may be used, for example. The stove flue pipe is inserted through the roof opening and the bracket around the pipe is lifted until the roof is tight, and then secured. At least 5 pipe elements should be used for unit tents.

NB!Ensure that the camp stove has a good base. If not, it will sink, causing a large hole in the snow around the stove.

The work pit should be dug in accordance with the sketch in figures 29 and 30.

4.2.4 M-94 camp stove

4.2.4.1 For the technical handbook refer to: http://felreg.mil.no/felreg/pubdwnld?pubVerld=12471&pdfName=Teltovn.pdf

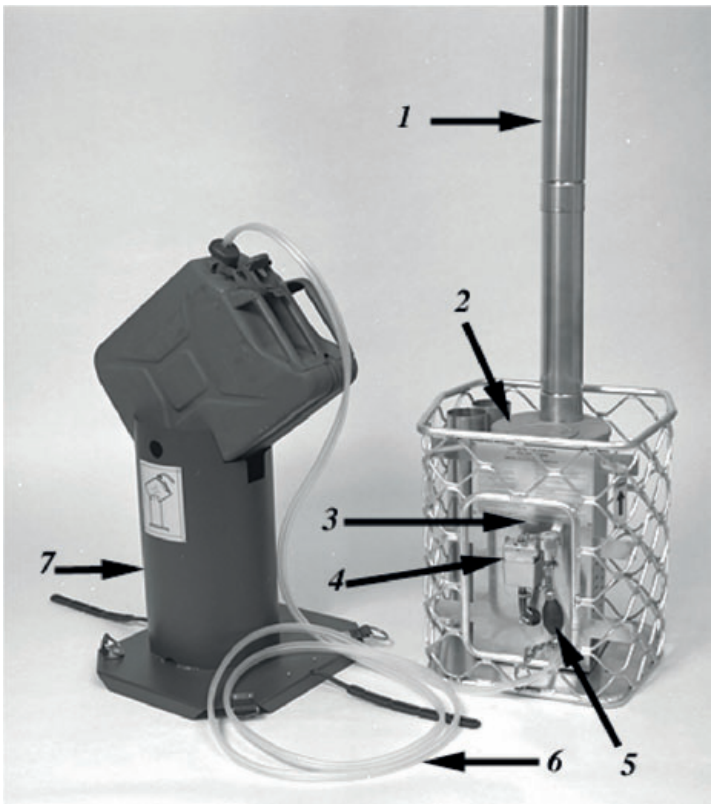

Figure 34 - M94 camp stove

1.	*Stove flue pipe*
2.	*Combustion chamber*
3.	*Filter housing*
4.	*Regulator*
5.	*Ball pump*
6.	*Fuel hose*
7.	*Fuel can stand/lid*

4.2.4.2 Lighting camp stoves

- Ensure that the WHOLE hose has been pulled out of the holder and is not

touching any parts of the camp stove that become hot. Open the regulator and pour a little fuel into the base of the combustion chamber. 1-2 tablespoons is sufficient. Close the regulator

- Place a small piece of paper into the combustion chamber (one piece of toilet paper is adequate). Ensure that the paper has made contact with the fuel
- Ignite the fuel in the base by dropping in a burning match or a burning piece of paper. Adjust the regulator to the lowest level (1) when the fuel begins to ignite
- Close the sliding cover
- This should always be closed when the camp stove is burning. Otherwise, the camp stove will draw false air and soot
- After a few minutes, the camp stove will burn cleanly and may be adjusted to the desired heating level
- If the heating level is increased before the camp stove is hot enough, the fuel will enter faster than it is being evaporated and the camp stove will start producing sooty smoke. Adjust to the lowest setting (1) until the stove is hot and the sooty smoke disappears
- Adjust to the desired level
- If too much fuel is used when attempting to light the camp stove, correct combustion will not be achieved. In the worst case scenario, the stove may be filled with fuel up to the lowest air vents and may leak out. If such a large amount of fuel was to ignite, the evaporation rate would be so powerful that the stove would burn with a significant air deficiency. This could result in extreme heat and soot development with a high risk of fire and blackening of the tent
- If, for any reason, so much fuel is allowed to enter the combustion chamber that the whole base is covered, the camp stove should be removed and emptied before being lit
- It is important to ascertain that sufficient combustion has been achieved at the lighting phase

NB!Do not move away from the stove before it is burning cleanly.

4.2.4.3 Operation

During operation, a little soot will accumulate in the interior of the combustion chamber and the stove flue pipes. A daily routine of stove inspection should be established. If necessary, clean all stove flue pipes and remove soot from the combustion chamber.

If, for any reason, a considerable amount of soot is permitted to accumulate in the combustion chamber, the stove's flow efficiency will be altered. The result will be sooty smoke and the soot will, with increasing speed, continue to accumulate in the both the combustion chamber and the stove flue pipes. It is therefore important to study the smoke that emanates from the stove. If it is evident that the smoke is sooty during normal stove use, the stove must be cleaned. If such cleaning is not carried

out, the stove will eventually produce smoke containing soot flakes that could fall into the tent, soiling the tent. Tents that have become sooted are extremely difficult to clean. The intervals between cleaning during normal operation may be considerably extended if any accumulated soot is brushed away from the stove's walls onto the base where, to a large extent, it will burn up.

Where different conditions do not dictate otherwise, it is recommended that the stove burns at a medium heat level (levels 2, 3 and 4) as there is minimal soot accumulation at these levels. Using six pipe elements instead of five will also result in cleaner combustion.

4.3 PATROL TENT

4.3.1 General

4.3.1.1 Several divisions use civilian tents from various suppliers.

Figure 35 - Helsport Svalbard 5 mountain tent with windbreak

This type of tent distinguishes itself from a canvas tent (button tent), in that it is lighter in weight. The type of fabric that such tents are made of is often quite different, too. The Norwegian Armed Force's canvas tents are primarily made of cotton, while most mountain tents are made of polyester or other types of synthetic fibre.

4.3.2 Erection of tent

4.3.2.1 Where possible (e.g. on a pulk sled) the tent may be transported partly assembled insofar as the poles may be stored partly assembled in the tent's sleeves. Thus, much time is saved during erection. Be aware that the tent may become more easily damaged during transportation, so a cover should be used.

This type of tent is erected in such a way that one of the short walls faces towards the wind. This will achieve optimal air flow through the tent, which will result in less

icing within the tent itself.

During strong winds, it is important that the tent is secured during erection and that several guy ropes are not attached to the same tent peg.

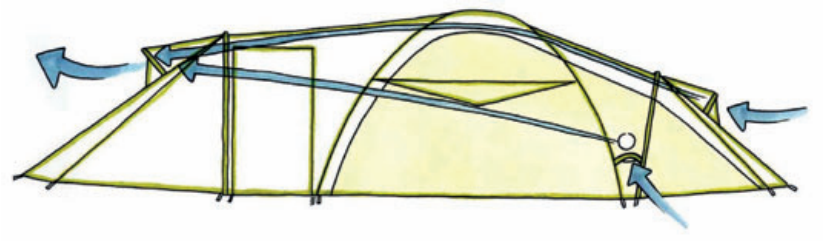

Figure 36 - Principle of air flow in a mountain tent

4.3.3 Problem areas

4.3.3.1 The following problem areas have been identified when using this type of tent:

- Icing in tent pole shafts that makes it difficult to insert the poles after a few days' use
- Zips are easily destroyed as a result of icing and rough use
- Tears in the canvas. Avoid entering the tent wearing a combat vest
- Elastic bands on the poles will lose their elasticity in cold weather. This can be countered by tightening the ends of the elastic bands
- The air vents in the tent must be kept open, particularly during cooking/heating, to avoid a build up of carbon monoxide and condensation
- A significant amount of ice will form on the roof as a result of steam from cooking, snow-melting and exhalation. This ice should be removed before the tent is dissembled. Pack all personal materiel and use a brush to remove ice. Shake the tent before it is packed into a bag
- The compression bag, which accompanies this type of tent, will often be too small when the tent has been in use and has become iced. Consider obtaining a larger bag to place the tent in (e.g. packsack)
- Pegs should be improvised. Bamboo pegs of around 50 cm in length work well

5 IMPROVISED BIVOUACS IN THE FOREST

5.1 GENERAL

Improvised bivouacs should only be used when more suitable alternatives are not available, or where prevailing weather conditions do not permit the erection of tents. Seldom will these be used by whole divisions but an improvised bivouac may be necessary to survival for individual persons and patrols that have become detached from their divisions. It should be understood that it can take a long time to construct an improvised bivouac and that personnel may become wet during the process. It is therefore advisable to choose a bivouac providing shelter that requires the least amount of effort to erect.

In a forest, it is virtually always possible to find wood to build a bonfire with. Personnel should organise themselves so that they can utilise the heat in the best possible way.

However, if extreme heat is generated, personnel can become burned on one side of their bodies while also freezing on the side that is turned away from the heat source. This can be prevented if personnel ensure that a screen is positioned behind them and, additionally, place a reflector behind the bonfire. Such a screen can be easily rigged with one or more types of tent canvas, or similar.

5.1.1 Lean-to shelter

5.1.1.1 A lean-to shelter is preferably built between two trees. The distance between the trees depends upon how large the lean-to shelter is going to be. However, a lean-to shelter is seldom built to accommodate more than 4-5 persons. Neither is it usually dug completely into the ground. Chop three long sticks that are 8-10 cm thick and 30-40 cm longer than the distance between the trees. Also chop 6-10 long sticks, 5-8 cm thick, for the roof and side poles. The length should be adapted at the site. Secure one of the thick sticks between the trees 150-180 cm above the ground. Two of the remaining long sticks should be placed on the ground as a foot pole. The other long stick should be placed around 2 metres further in to the shelter. These should be held in place with stakes. Roof poles are added and secured. Interconnected canvas sections, a tarpaulin or Jerven bag, which should also hang down at the sides right down to the ground, may be stretched across this frame. Attach the canvas section(s) with side poles and a longitudinal stick facing the ground. Place snow around the edges in order to prevent draughts.

In order to utilise the reflection of the bonfire's radiated heat, the pitch of the shelter's roof should be between 40 and 60 degrees. Then, the bonfire's radiated heat and the heat reflector will, in turn, be reflected from the roof and spread throughout the shelter. Another important reason for this is that with such an angle of pitch, precipitation will drain off the roof and not through the roof. This is particularly important when sprigs or leaves are being used as a roof covering.

If a canvas or tarpaulin is not available, the roof may be covered with rough sprigs that are inserted in between the roof poles and right up and down the side walls. Lighter sprigs may be placed on top. The sprigs should be placed with their truncated

ends facing upwards. Begin at the bottom and place the sprigs so that they overlap like roof tiles.

This method of roofing provides the best protection from water drips. If there is sufficient time, the roof may be completely covered in long sticks instead of sprigs. A layer of sprigs should also be made on the floor, at least 15-20 cm thick.

Figure 37 - Screen roof with 'nying' bonfire

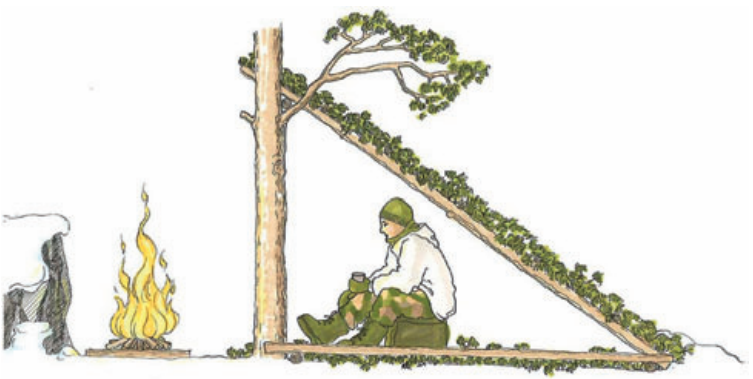

Figure 38 - Screen roof with bonfire and reflector

Figure 39 - Lean-to shelter with Jerven bag. Rock wall as reflector

5.1.2 Shelters made from sprigs or birch

5.1.2.1 A shelter made from sprigs or birch is another adequate type of emergency bivouac. A lean-to shelter requires a proportionally high amount of heat and only radiant heating is utilised. In a shelter made of sprigs (birch) it is possible to manage with a little less wood as the air in the shelter is heated. A framework of long sticks is made; tent canvas, sprigs, boughs or birch are used for the walls, to which a thick layer of snow is added at the bottom. The best solution is to partly dig the shelter into the snow. It is important that the roof and walls are as sealed as possible.

Figure 40 - Sprig shelter

The only implement required to build a lean-to shelter or sprig shelter is a knife or axe and preferably a little cord. Sprigs that are used to make a base must not be too rough. Insert the severed end of the sprig into the snow and lay it evenly and thickly so that personnel are not affected by sticks protruding into their backs. Sprigs from deciduous trees are quite adequate for making such a surface.

5.1.3 Winter bonfires

5.1.3.1 Even in the middle of summer, night-time temperatures at dewfall can be considerably low. Even if personnel do not freeze to death, the quality of their sleep will, nonetheless, be affected. It is therefore of vital significance that personnel are trained in how to build a fire and how to make the most out of the fire. A fire is principally used to keep warm, dry clothes and cook food. In certain emergencies, it may also be used as a means of signalling. The ability to make a fire can be a decisive factor in respect of whether personnel are capable of fulfilling their duty, and, in extreme circumstances, even surviving.

During winter, snow at the bonfire site should first be trampled, after which a base comprising poor quality, wet wood is laid. The will prevent the bonfire from sinking into the snow, creating a lot of smoke and being extinguished by the melting snow. Another option is to dig the bonfire into the ground. If this solution is chosen, an air vent down to the bonfire must be established so that it receives a sufficient amount of oxygen and draught in order to burn sufficiently. A reflector should be built on the opposite side of the bivouac in order to exploit as much of the bonfire's heat as possible.

The reflector could be, for example, a rock wall or a large stone. Ensure that there are no cracks in the rock wall as this could result in further cracking and possible rock fall.

Access to wood is governed by the climate, vegetation and available tools. Look for tree stems and branches on which the bark is about to fall off and then tap on the tree. A hollow sound indicates that the tree is dead and dry – this type of wood is preferable for lighting a bonfire. Under normal conditions, fresh birch is not suitable wood as it contains too much water. However, fresh birch may be used if the bonfire has a strong core temperature. The principle of making a bonfire is to initially start with fine materials then gradually add coarser materials that eventually generate enough heat to ignite coarse wood.

The temperature of the bonfire is important. A high temperature will be achieved by using plenty of kindling. Kindling will permit wet wood to be eventually used.

To avoid using the wettest part of the wood, the wood may be cleaved in order to gain access to the dry heartwood that should be placed downwards towards the flames.

Removing bark and lichen from the outside of the wood will make it less wet.

There are three separate main groups of wood:

Lighting materials:

- The thinnest white shavings that can be extracted from birch bark
- Beard Lichen dry shavings
- Dry grass

- Torn up pieces of cloth
- Torn up pieces of paper
- Birch bark
- Wood shavings
- Cotton grass

Kindling:
- Small dry twigs (especially beneath pine trees)
- Torn wood
- Wood shavings
- Cardboard

Wood:
- Increasingly larger pieces of wood – after one to two hours the bonfire will usually have attained a core temperature sufficient to burn all combustible materials.

During a march through a forest, every available opportunity should be taken to gather lighting material. This should be placed in pockets to dry. When it is dry, it should then be placed in plastic bags. Personnel should ensure that they always have a sufficient quantity of material to light 3-4 bonfires. When collecting wood, it is easy to gather too little. A rule of thumb is that personnel should always collect twice as much wood as they think they will require.

When it is time to light the bonfire, start with the driest material. Use the smallest pieces possible that have the largest surface area. Eventually add larger and larger twigs as the bonfire starts to burn well.

Figure 41 - Top-fired winter bonfire on snow

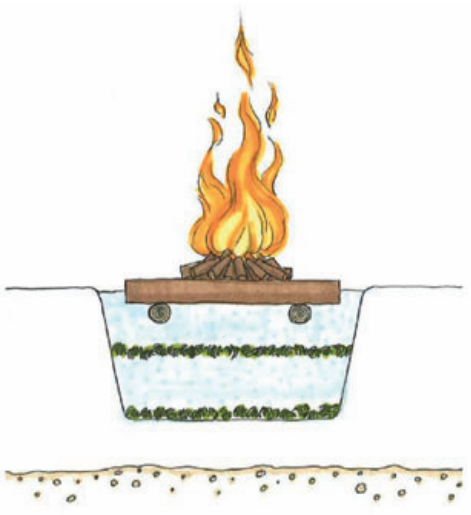

Figure 42 - Winter bonfire with strengthened base to avoid melt-down

The 'nying' bonfire is useful for heat generation. Thick, dry sticks must be used (dry pine is best). The sides of the sticks that are facing towards each other should be scraped clean. Kindling, dry chips and twigs should be placed in the space in between. The 'nying' bonfire burns for hours without supervision. Personnel should be located no more than around 1 ½ metres from the heat. Such a bonfire can be advantageously used for a lean-to shelter, for example. The bonfire should then be the same length as the bivouac in order to achieve the best level of heat within the bivouac.

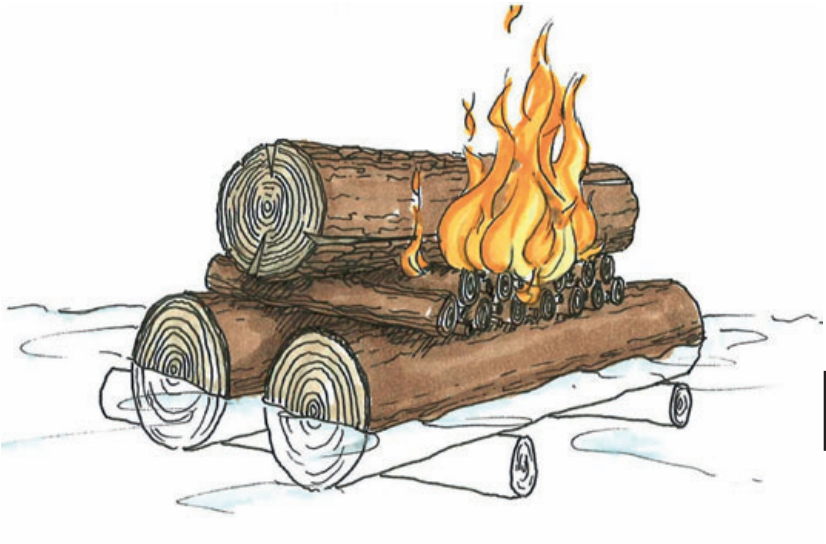

Figure 43 - 'Nying' bonfire

5.1.4 Hollows beneath trees – Norway spruce

5.1.4.1 If, for one reason or another, it is not possible to build an open fire, the snow's heating power must be utilised by building a snow bivouac, a hollow beneath a tree, or similar. Snow contains air and in the snow itself there are rarely very many degrees of frost. The ground temperature is around zero degrees.

A dense spruce tree is an especially good location to build a hollow . The roof may be strengthened with branches and twigs. On top of this a thick layer of snow should be laid. If the layer of snow is too thin, the hollow will be as cold as the air outside. A thick layer of sprigs should be placed on the floor. The entrance should be made as small as possible and closed with a block of snow, or in some other way.

NB!

- During periods of mild weather or extreme wind, a bivouac under a Norway spruce can become extremely wet due to snow and moisture seeping through the branches.
- The bonfire should be sited away from the sleeping area so that snow does not melt over personnel.

Figure 44 - Hollow beneath a spruce tree

Figure 45 - Norway spruce strengthened with a Jerven bag

5.1.5 Tent canvas and survival canvas

5.1.5.1 All soldiers are supplied with a section of tent canvas. In certain divisions there is also another type of canvas – a survival canvas, made from light, waterproof material. The most predominant variant is supplied by Jerven, the so-called Jerven bag.

If a member of personnel is alone and has only been able to build a small bonfire, he/she should wrap a tent canvas or Jerven bag around him/herself so that it functions as a screen, and huddle up close to the fire. The canvas may also be raised with a stick or possibly a ski pole, or be hung up in trees with a bonfire in front of it, or used as a poncho.

During a break in a march, it is smart for personnel to wrap themselves in a Jerven bag in order to gain an extra layer of insulation.

Figure 46 - Using a Jerven bag during a short break

Figure 47 - Tent canvas screen with car door as reflector

Figure 48

Figure 49 - Lean-to shelter using a Jerven bag

5.1.6 Igloo

5.1.6.1 An igloo is a good alternative to a bivouac when there is little snow on the ground. It should be - 5 degrees or colder in order for the snow to settle and become compact. An igloo may be built for a single person or for larger units.

The wall thickness should be 20-30 cm with compact snow. Before the snow has settled, sticks of 20-30 cm should be inserted to prevent personnel from removing too much snow during excavation of the hollow. If there is enough snow and enough time available, the principles for a work pit and bench bed should be adopted. The area in which personnel will lie down should be covered in spruce branches or other types of insulation material. The opening should be sealed with blocks of snow or backpacks.

Figure 50 - Stepping down the circumference of the igloo

Figure 51 - Building up the snow mound for the igloo

Figure 52 - Inserting sticks to mark the thickness of the igloo

Figure 53 - The finished igloo

Figure 54 - Screen comprising 7 piece tent

6 IMPROVISED BIVOUACS IN THE HIGH MOUNTAIN

6.1 GENERAL

Situations may arise in which a tent cannot be used as a bivouac. For example, this could be where, for different reasons, personnel do not have access to a tent or where the weather is so extreme that it is not possible to erect a tent. Above the timber line and in the high mountains, this is a challenge. This means that personnel are often in a state of emergency when alternative bivouacs need to be erected. This in itself can make for very challenging working conditions. Personnel will be also be more exposed to snow, wind and dampness over a longer period of time than in the case of erecting a tent bivouac.

6.1.1 Terrain

6.1.1.1 In order to build an improvised bivouac in the snow, hard-packed snow must be located. In a forest, snow is evenly distributed and is often loose. In mountain forests (birch forests) the trees still serve as a windbreak and the snow is most often even and loose, although not as much as in a coniferous forest.

However, on bare rocky terrain, where it is often extremely windy, personnel will face different possibilities and limitations. The snow becomes quickly hard-packed – and high ridges, peaks and slopes are often lacking in slow. The snow is primarily located on the lee-side of mountain peaks, ridges and depressions. Large snowdrifts and overhanging snow banks tend to form on the lee-side.

With all types of bivouac in the snow, the following points must be observed:

- Ascertain the risk of avalanche
- Carry a spade so that you can dig yourself out, if necessary
- Establish and maintain an air vent. Use a pole for this task
- A stearine candle that does not burn well is an indication that the bivouac contains too little oxygen
- Do not use cooking apparatus, or similar, within the bivouac
- During peacetime: mark the entrance in all weather conditions – the weather can quickly change in the mountains!

6.1.2 Ventilation in a snow bivouac

6.1.2.1 In a newly-built snow bivouac the walls (snow) should provide a degree of ‘natural ventilation’, which would usually give sufficient ventilation. Over a period of time, body heat will cause the temperature to rise and the snow on the walls will melt forming ice on the walls (they become glazed) so that air in the snow is unable to enter the hole and provide ‘ventilation’. Therefore, for safety’s sake, a vent hole with a minimum diameter of 10 cm should always be made in the roof. This should be kept open with a ski pole.

The oxygen content of the air can be checked by burning a stearine candle. If the stearine candle does not burn well or goes out, personnel must check immediately if

the air vent is open.

The air vent and, if required, the entrance, should be opened and the hole aired sufficiently. During peacetime, a stearine candle should always be burning in the snow hole or snow pit when personnel are present. The candle should be placed at the head end where personnel are lying.

When using cooking/heating apparatus, or similar, oxygen consumption occurs very quickly. Moreover, it generates dangerous carbon monoxide. Carbon monoxide is colourless and, to all extents and purposes, odourless and tasteless. It is therefore exceptionally dangerous. An individual can be poisoned and lose consciousness without any prior warning. Heat from the cooking apparatus will also hasten glazing of the interior of the snow hole/pit.

Therefore, cooking should take place outside the snow bivouac.

Use of cooking/heating apparatus inside a snow bivouac is STRICTLY FORBIDDEN!

6.1.3 Flat pit

6.1.3.1 On an open plateau a flat pit for 4-5 persons can be built when there is sufficient snow depth, preferably above 1.5 metres. An area approx. 0.75 x 4.5 m (length of two persons) should be marked out in the snow with the longitudinal side facing the direction of the wind. Dig to a depth of around 1.5 m. The work pit should be no wider than 0.75 m. Lower down, the pit should be enlarged at the sides to achieve a width of approx. 0.75 m per person. If possible, bench beds should be established with a work pit at the centre.

A work pit is usually covered with blocks of snow that have been positioned on the edge. However, birch with loose snow can also be used. It may be necessary to use sections of tent canvas, skis and poles covered in snow. The entrance should preferably be in the centre of the sheltered short side. Recesses for equipment, as well as vent holes, should be made.

Figure 55 - Fitting up a flat pit

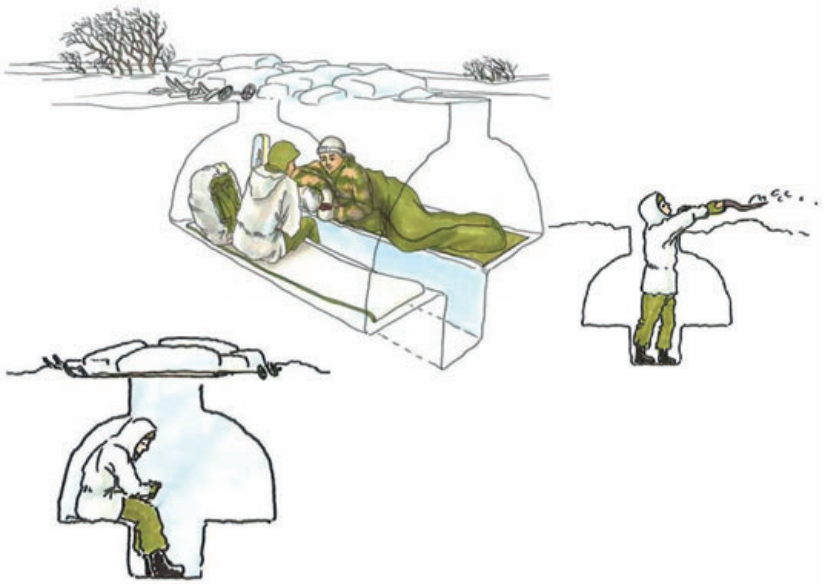

Figure 56 - Sketch of a flat pit

If the snow is not deep enough, it is possible to build the pit to the desired height with blocks of snow. For optimal heat exploitation in an emergency bivouac, personnel should lie closely together. Heat loss will then be substantially less.

Figure 57 - Flat pit in little snow

6.1.4 Edge pit

6.1.4.1 An edge pit may be used when personnel have access to a small snow bank or snowdrift. This type of bivouac is easy to build and therefore well suited as an emergency bivouac.

Figure 58 - Excavated edge pit for two persons

Figure 59 - Closed edge pit

NB!

- There must be no danger of an avalanche in the area where the snow bank is being used
- The snow bank must be compact and no higher than 5 metres
- The thickness of the snow in the excavation area should be 2 metres vertically and 3 metres horizontally in order to be of an adequate size

6.1.5 Snow hole

6.1.5.1 A snow hole should primarily be built in snowdrifts and snow banks. It is recommended that several small holes (2-3 persons) are built, rather than larger 'unit' holes. Small holes are quicker to excavate and more effective as several persons can work together simultaneously. They are also safer as the risk of 'roof slip' and glazing is reduced.

Be aware that it is possible to locate almost ready-excavated holes or pits in dry creek beds, among other places, which are simple to adapt to snow holes or snow pits.

- The thickness of the snow in the excavation area should be 2 metres vertically and 3 metres horizontally in order for the hole to be of an adequate size
- The snowdrift being used for the snow hole must not be more than 5 metres high and the hole should be excavated high in the snowdrift due to the risk of an avalanche occurring.

The opening to a completed snow hole is small. However, this does not mean that personnel should use the same small opening when working. If you are working in a standing position, there is less chance that you will become wet and cold. A small, low opening will result in personnel becoming wet when the hole has been completely excavated. If the snow is solid and easy to cut into blocks, the whole opening should be excavated so that personnel may stand and work. The opening can be closed at a later point with blocks of snow. To more easily reduce pressure on the roof of the snow hole, as well as facilitating easy disposal of the excavated snow, the hole opening should be located as high as possible in the snow bank. The walls and roof of the hole must comprise 50 cm hard-packed snow, as a minimum.

The 'sleeping bench' should be higher than the entrance's upper edge. In this way, warm air will be prevented from being drawn out and the temperature on the sleeping bench will be constant even when the entrance has not been closed.

For reasons of strength, as well as to prevent dripping when the temperature rises, the roof must have an even arch form. A vent hole should be made in the roof. This should be kept open with a ski pole, for example. If you excavate several holes alongside each other in the same snow drift, you may construct small communication channels in order to easily communicate between the holes.

For supplementary provisions, refer to UD 2-1, Safety Provisions for the Norwegian Armed Forces.

Small holes are more durable (less slippage) than large holes. Therefore, several smaller holes should be considered in preference to larger holes.

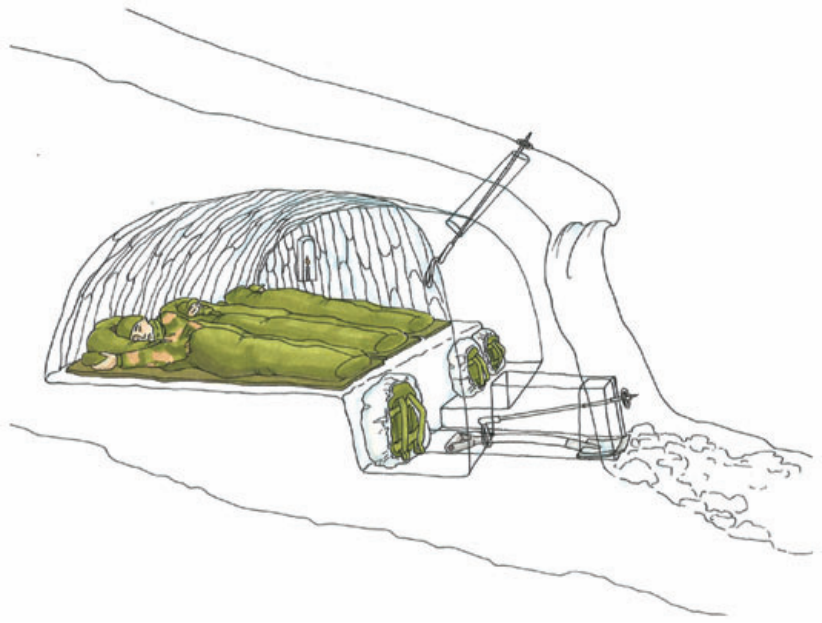

Figure 60 - Example of ventilation holes in snowcave