

SHELTER CONSTRUCTION TECHNIQUES

By Nick Weighton, February 2008

This handout augments the Survival Section in your Student Manual and is the follow-on complement to the segment titled “Survival Guide.”

You can build different types of survival shelters depending on the equipment you carry, natural resources that might be available, and the knowledge and skills of you and your group. A number of shelters are discussed for summer and winter use including dimensions, resources and construction techniques for each. Dimensions and techniques are intended as flexible guidelines. Common sense and good judgment must be applied during construction.

Keep an open mind about the types of shelters you could build in a survival situation. More than one might be appropriate depending on the circumstances. Knowing how to construct a variety of shelters opens up options from which to choose the optimum one. If you are ever in a survival mode, evaluate the conditions and resources, then select what you think is the “best” shelter for your situation. Be flexible and do what is smart.

At the end of the handout are techniques for using a signal mirror and some extra tips on signaling.

I. SURVIVAL TOOLS AND SUPPLIES – (BASIC ITEMS ARE CUTTING TOOL, CORD, TARP, SHOVEL, AND INSULATED PAD)

- Your mind is the most important “tool” but other tools are very helpful.
- Cutting tool – essential for efficiently building most shelters using natural materials.
- Cord (parachute type) – needed for lashing things together, carry 100 ft or more.
- Thermal blanket/Tarp – numerous uses: use as a shelter, entry closure, windbreak, roof to block rain, line interior walls of a shelter to deflect cold air, wrap around yourself to stay dry, protect a casualty from the elements, convert into a stretcher, and for signaling if brightly colored. (Note: Tarps and space blankets **do not** insulate you. Blue tarps are not as visible from a distance as you might think.)
- Shovel – small, lightweight but durable. Use for digging snow shelters or adding a layer of snow on pine bough roofs and walls.
- Insulated ground pad – $\frac{3}{4}$ length is sufficient, closed-cell foam pad is better than an air mattress. Can be used in survival or for a casualty. It eliminates the time and effort to gather pine boughs and avoids the dependence on natural materials or other forms like clothing and packs. A pad allows more room in a tarped shelter since a thick layer of pine boughs is not required.
- All these items are light weight, convenient and quick to employ. They are relatively inexpensive, weigh only a few pounds and serve multiple uses.

II. MANUFACTURED SHELTERS

- A bivy tent is an excellent solution for making a shelter. You don't have to depend on nature for all your construction materials.
- It can be set up quickly and eliminates searching for materials in the dark.
- It can be augmented with natural materials to increase insulation and protection against the elements.

All shelters discussed throughout the remainder of this handout are made using natural materials and are thus dependent on what is available to you. They are intended for two people. Building a 2-person shelter is normally better than a 1-person shelter. You can divide up tasks, use resources more efficiently, share body heat and supplies, and is psychologically comforting. Shelter dimensions are "approximate" measurements. Many of the shelters use layers of pine boughs as insulation for walls, roofs and floors. During winter months, snow can add another layer of insulation. On sloping terrain, always put a shelter entrance down slope. On level ground, put the entrance downwind the best you can determine. In some cases, tarps can be substituted in place of pine boughs for roofs or walls. Depending on the weather or time of year, tarps could be essential for keeping out rain or snow melt. When ground pads are used for floor insulation, they can be laid on top of pine boughs thus providing more insulation. If pads are used in place of pine boughs, the interior height of a shelter should be lowered to reduce the amount of cold, dead air. Leaves and dead pine needles are common substitutes for pine boughs as insulation.

III. PUP TENT

- Very quick shelter using minimal resources. Good for moderate weather conditions.
- Configure an open-ended pup tent using a tarp and cord spine. One end can slant to the ground or both ends can be raised. Anchor the sides securely to the ground.
- Ends must be closed up using a second tarp or nature materials. Create a small opening that can be sealed up with a "door" closure after entering.
- A closed cell foam pad or air mattress should be used for floor insulation unless several tarps are available to raise the roof sufficiently so pine boughs can be used for floor insulation.

IV. TREE TENT

- Makes a very good, reasonably quick shelter.
- Find a 15-20 foot high tree with a lower trunk 3"-6" in diameter and lots of limbs (full like a big Christmas tree).

- Cut through the trunk 3 ½ to 4 feet above the ground. Fell the tree upslope if on an incline (dropping upslope creates more interior space than down slope). On level ground, fell the tree with the entrance downwind. Lash the tree securely to one side of the trunk.
- Trim out interior limbs in an inverted "V" fashion and use the limbs as floor insulation.
- Cut off excess exterior limbs and lay on "ribbed" branches down both sides of the felled tree.
- Cut down more trees and use the branches to fully insulate the floor. Form either a slanting or domed roof of branches over the ribs and tree spine.
- Close up the entrance leaving about a 2' x 2' opening. Close it up with something after entering. A good closure uses a "Cork in a Bottle" concept. Lay out a 5x7 tarp and fill it with soft ends of pine boughs. Draw the corners together and tie them off leaving about 3-4 feet of cord to pull the "cork" in behind you after going inside the shelter. The closure will conform to the shape of a small entrance. Another closure is a "door" made from short logs lashed together side by side.
- Insulate the walls and floor with a minimum of 12"-18" of pine boughs. You can make the walls thicker if desired.
- If you're expecting rain or wet snow, cover the shelter with tarps. You can use them between the frame and boughs or on top of the boughs. Overlap tarps in a "shingle" fashion to bleed water down over each lower tarp.
- If good snow is available, shovel 12"-18" of it over the entire shelter for additional insulation. Be cautious using wet snow due to its weight and potential drainage into your shelter.
- You can build a log frame and ribs with lashed materials and achieve the same effect as a tree tent.

V. LOG HUT

- You are essentially building a small, crude log cabin without windows.
- Dimensions: 4' wide, 4' high (interior height) and 7'-8' long.
- Find several trees that can serve as corner posts. You can fabricate a 3rd or 4th post by lashing horizontal logs to vertical logs.
- Cut fallen or green trees that are several inches thick and lash them together to form walls. Don't "interlace" adjoining logs or you'll have gaps that will require filling. You can brace the outside of the walls with angled logs for added support.
- Incorporate a small entrance (2'x2') at the down slope or downwind end of the hut and make a closure device of some type (cork in bottle, lashed log door, tarp).
- Cover the roof with logs.

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- Insulate the roof, walls and floor with 12"-18" of pine boughs. (You can insulate the roof and walls as thick as you want.)
- In winter months, cover the pine boughs on the roof and walls with dry snow for added insulation.

VI. SNOW TRENCH

- This is a good winter shelter (takes about 1 ½ to 2 hours to build).
- Dimensions: 4' wide, 4' high (interior height) and 7'-8' long.
- Interior size is important. Too small won't give you room to maneuver, too big means there is more cold, dead air to absorb heat you are generating.
- You don't need snow four feet deep to make a snow trench, 1'-2' is adequate. Pile snow into a large mound and dig it out after it reconstitutes. (Make the mound about 10'-12' long, 7'-8' wide and 3' high. Use interior snow to build the wall height up to 4'.)
- Dig out the interior of the trench starting from the entrance. Keep the entrance small (2' wide) and widen the interior as you dig it out.
- Dig the main trench about one foot smaller in all directions than the final dimensions so you can enlarge it as needed. You can always make it bigger, but you can't always put snow back if you dig it too wide or too long.
- A good technique is to build a 6-10 foot long entry "tunnel" or "ditch" about 2' wide and 2' high down slope or downwind from the main shelter opening. Cover it with logs, pine boughs and snow. This gives you two entry closures allowing a transition when entering/exiting the shelter. Since only one "door" is opened at a time and then resealed, the effects of outside elements like wind and blowing snow are minimized.
- Cut 3"-4" diameter trees 8'-12' long depending on the density of the snow. The softer the snow, the further out the logs need to extend out over the snow for support.
- Drag trees to the shelter site then trim off limbs to use later for insulation.
- Start placing roof rafters perpendicular at the "back end" of the trench and work toward the entrance. Place rafters a foot or so apart. (If snow is extra soft, put parallel rows of logs a foot or two out past the edges of the trench to make a foundation for roof rafters to rest on.)
- After working your way to the entrance, place a second layer of rafters perpendicular to first ones. Then lay any limbs that do not have needles or leaves on top of the rafters as extra filler to keep pine boughs from falling through.
- Build for worst case scenarios. The roof will be heavy after adding pine boughs and snow so your materials must be strong enough to support it. And what if there's a snow storm later?!

- Cover the main shelter floor with 12"-18" of pine boughs. (You can cover the floor with pine boughs for added insulation even if you have a foam pad.)
- Put roof rafters on the extended entry tunnel (the tunnel floor does not need to be insulated). Cover the main trench and entry tunnel roofs with 12"-18" each of pine boughs and snow.
- If expecting rain or wet snow, dome shape the roof boughs and cover with tarps then cover with snow.
- Close up both entrances using a cork in a bottle technique, log doors, snow blocks, tarps or packs.
- Above treeline, you can use skis, poles or rope as roof rafters. Lash down roof tarps and cover lightly with snow. Strong snow blocks are another option for making a roof.

VII. TREE BLOWOUT OR "DONUT"

- Formed by the wind swirling around the trunk of a tree.
- Can use as a starting point for a circular snow trench. Can block off a portion of the blowout if all of it is not needed.
- Lash roof rafters to the tree trunk a couple feet higher than the snow level to form a slanting roof. Cover the rafters with 12"-18" of both pine boughs and snow.
- Insulate the floor with pine boughs and close up the entrance. You can make an entry in the roof ("manhole cover") or a long entry tunnel the same as with a snow trench.

VIII. SNOW BLOCK SHELTER

- You can build an entire shelter from blocks of packed snow or incorporate them into a snow trench.
- Build walls of snow blocks overlapping each other like a brick wall. Blocks for the roof can be arranged in an "A-frame" fashion or laid flat.
- "Offset" opposing A-frame blocks so their edges (side seams) don't line up with each other. This reduces the chance of blocks dislodging the one opposite them. Position each block so it tilts against half of two opposite blocks resulting in an alternating alignment of opposing blocks.
- Can put snow blocks flat on roof rafters of a snow trench but the rafters must be strong enough to support the weight.
- Can also use blocks to build windbreaks around a shelter or fire area.

IX. SNOW CAVE

- Excellent shelter but not necessarily the best to build.
- Don't attempt if you've never built one before, survival is not the time to learn by trial and error.
- Snow caves are very labor intensive and can take 3 or more hours to build. You need the right snow conditions, skills and tools to build a snow cave.
- There are added risks -- you might encounter hidden boulders or ice, the roof can collapse during or after construction, and you can get wet while building them or sitting inside.
- If on a slope, start the entry point several feet lower than the eventual floor level. Dig in a few feet then slant the tunnel upward several feet. Dig out a dome-shaped interior like a VW Beetle without seats. Smooth the roof and walls to prevent water dripping on you and make a couple small holes in the roof for ventilation. (On level ground, make a U-shaped entry tunnel to create a trough area lower than your floor where cold air will settle.)
- Insulate the floor with pine boughs or pads and close up the entrance.
- Snow caves are naturally insulated and provide excellent protection from the elements. Body heat and heat producing devices can significantly raise the temperature inside. Be aware this can cause walls and ceilings to melt resulting in dripping and puddles.

X. QUANSI

- It is an "above ground" snow cave.
- Shovel snow into a large mound a few feet higher and wider than your intended interior area.
- Wait several hours and dig out the interior. Plan on 4-5 hours for snow to reconstitute sufficiently to support itself. A quansi has risks like a snow cave – collapse and dripping water.
- Quansis take too long to build as an initial shelter but could be considered in an extended survival situation lasting several days.

TIPS ON SIGNALING IN ADDITION TO THOSE IN YOUR MANUAL:

- Carry several manmade signal devices and augment them with natural materials when available.
- Employ multiple signaling techniques, i.e. mirror or smoky fire for long range signaling and bright colored tarps for close range recognition.

- Use bright colored thermal blankets/tarps to form an “equals sign” or letters like V, T, H, L. Cut thermal blankets in half if needed. Can use logs/pine boughs on snow to form the same symbols (they don’t form naturally).
- When using a signal fire, don’t cover the fire completely with pine boughs, leave a quarter “pie wedge” uncovered so air can flow in and under the boughs causing the heat and smoke to rise.

SIGNAL MIRRORS:

- Specially made mirrors– these have a nonreflective center area with wire mesh embedded in the glass. Instructions for using the mirror are printed on the back of it.
- Techniques for using special mirrors:
 - Angle the mirror so a sun spot appears on the palm of your hand. Move the mirror to your eye while keeping the sun spot on your palm.
 - Slightly rotate the mirror until a small image of the sun appears in your vision in the center mesh area of the mirror. You will use it as a “sighting device.”
 - Raise your head and mirror together while keeping the “sun image” in the mesh area.
 - Turn head and mirror simultaneously to “sight” where you want the sun’s reflection to go. The sun’s reflection is beamed wherever you position the small sun image.
- Field expedient methods for using glass or metal mirrors (CDs and credit cards don’t work very well):
 - Method 1--Extend your arm full length with fingers together and pointed upward with the back of your hand toward you.
 - Hold a mirror just below one eye and adjust until sunlight appears on your fingertips. You should be able to barely sight over the top of the mirror with your eye.
 - Flicker sunlight on your fingertips while positioning what you want to sight to at the top of your fingers. Your eye, mirror and hand must be aligned in a straight row for this method to work otherwise the reflected light will beam out at a left or right angle.
 - Method 2--(Good for signaling aircraft and moving vehicles.) Extend your arm full length and hold up two fingers in a “V” fashion with the back of the hand toward you.
 - Hold a mirror just below one eye and adjust until sunlight appears at the base of the V.
 - Position a helicopter or vehicle between the first finger joints up from the bottom of the V and flicker your mirror as you track the movement of the

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object. Turn your upper body and arm simultaneously to keep your eye, mirror and V'd fingers in a straight line with the object.

- You can sometimes use a signal mirror on hazy or thin cloud days.

It is hoped you are never in a survival situation, but if you are, approach it with a positive attitude, work as a team and be determined to survive.