SHELTER DESIGN: SNOW CAVE SHELTER

CONSTRUCTION: EASY Single person, One hour or less.
EQUIPMENT: Shovel
SEASON: Winter

A Snow Cave is a simple shelter made created by locating a deep area of snow and then excavating a tunnel into it which turns upwards such that the entrance is below the shelter space. Construction is simplified by building it on a steep slope and digging slightly upwards and horizontally into the slope. This kind of shelter is ideal for emergency situations as it can be created quickly using any convenient tool and should less than an hour to hollow.

The Snow cave should not be confused with the Quinzee snow shelter.

Types of Snow Cave
There are two categories of snow caves. The first is an “Emergency” Style cave and the second is a “Planned” style cave.

An “Emergency” style snow cave shelter is a precisely what the name states, a shelter purposely is designed for an emergency situation. The requirements are simple; it should take as little time as possible; deep enough to provide shelter and just large enough for your needs.

A “Planned” snow cave is the opposite of the “Emergency” snow cave in that it is purposely designed with the goal of an overnight camping activity. In this case, the shelter should be constructed with an eye on sufficient robustness and designed to provide shelter and more comfort for survival.

KEY REQUIREMENTS FOR BUILDING A SNOW CAVE
There are several key requirements for building a snow cave.

REQUIREMENT#1: Digging implement: Everyone who builds a snow cave should have a means to dig out snow. The more people and shovels you have, the quicker your shelter will be built. In an emergency situation; your hands are an adequate digging tool if you don’t have a shovel. However, your gloves will get wet so you should change them as soon as you have completed your emergency shelter.

REQUIREMENT#2: Deep snow: A snow cave shelter design requires the entrance to be at a lower level than the shelter space. A minimum snow depth of 4 to 5ft (1.2 to 1.5m) is recommended. The best places to locate deep snow are in areas where snow has blown into large drifts such as along the sides of rock faces, ravines or steep sided hills.

REQUIREMENT#3: Robustness: Because you are digging into deep snow, make sure that the snow is stable and will not crumble or collapse on you once you tunnel inside the snow.
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KEY STEPS TO BUILDING A SNOW CAVE
There are several key steps that must be followed when building a Snow cave shelter. These are described below:

STEP#1: Pick a suitable site: Snow of minimum 4ft depth is required for this kind of shelter. Look for areas where snow has blown into large drifts. Examine the snow by pressing your hand on the surface. When snow has been blown into deep drifts it often been hardened by the layers that have built up. Look at the ground above you and check for potential avalanche situations where snow could slide down from a higher area on to your shelter site.

STEP#2: Tunnelling: Start to dig a tunnel into the snow. Dig inwards to make an entrance and then start to burrow upwards and hollow out the living quarters where you will find shelter. As you tunnel upwards, widen the burrow and keep an eye on two things.

- Ceiling of your shelter. As you tunnel upwards it will get brighter as sunlight start to filter through the snow. If you notice this, do not carve any higher as this indicates that you are close to the surface. If the ceiling is too thin as it may collapse in on you and destroy your shelter.
- Watch out for powdery snow. If you encounter powered snow, this means the snow has not hardened and your shelter may collapse. If you see this, pack the snow down and then add a layer of new snow on top. If you are not in an emergency situation, allow the snow to harden.

STEP#3: Let the snow harden: The action of gently packing the snow down and adding new snow results in a mix of layers of snow at different temperatures. This mixture will make the snow settle and harden and is called the sintering process. Depending on the temperature of the snow and how much you add, it can take anywhere between 1 and 2 hours for snow to harden enough for you to continuing to tunnel.

Sintering is the action of snow crystals losing their points due to motion such as wind and/or direct pressure. When the crystals points are broken they will fuse with other crystals to form larger snow crystals. This will result in a harder and crisp form of snow.

STEP#5: Size of the shelter: What size should your shelter be?
- In an emergency scenario, you need to make shelter as quickly as you can.
  - If you think the emergency situation will last for just a few hours, (i.e snow storm) make the shelter large enough to provide adequate shelter for your body in a sitting position
  - If you believe that you will need shelter for a longer time period (such as an overnight stay), then create a shelter large enough so that you can lie down and sleep.
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- In a non-emergency scenario, such as a planned overnight stay, carve the Snow Cave so that is large enough to lie down in and to have adequate space so that you don't feel claustrophobic.

Keep in mind that the longer and deeper your Snow Cave, the greater the effort to shovel snow from the depth of the cave and move it clear of the entrance.

STEP#6: Shelter Interior: Your Snow Cave should be designed with these features:
- Shape the interior of the shelter in a dome fashion. This makes the roof stronger and also allows moisture to run down the sides rather than drip.
- The interior should be large enough for you to sit up in.
- Create a ledge or elevated area where you can lie down and sleep. The ledge should be higher than the cave entrance. Cold air sinks to the lowest area of your shelter and as such you want to avoid sleeping in the coldest part of your shelter.
- Cut a minimum of two ventilation holes in your shelter. One on each side of the shelter. If there is a storm outside, your ventilation holes may get plugged up. Holes should be at least two inch in diameter to provide adequate ventilation and to not get plugged up with flying snow.
  > Care must be taken when creating the ventilation holes. If you do not know how thick your ceiling is, you could break through and collapse the shelter.

STEP#7: bedding: Do not lie on bare snow as it will drain your body heat very quickly. You will need insulation. This could be an air mattress, debris or cardboard sheets. If you use debris, make it thick enough to cover the area you plan to lay on. Choose material that you would like to sleep on.

OPTIONAL STEPS TO BUILDING A SNOW CAVE
If you are not in an emergency situation, consider the following:
- Collect lots of short sticks: and then make them all approximately 12 inches in length. It is very important that you make the sticks a similar length.
  - Push the sticks into the snow until there is about an inch or two left protruding. The sticks act as a guide for the thickness of the ceiling for your Snow Cave. This is a useful guide for creating a solid ceiling of uniform thickness and avoids collapse of the shelter if you make the ceiling too thin.
  - Do not use sticks after you have made your Snow Cave. The act of walking on top of the shelter or pushing the sticks through the snow may cause the shelter to cave inwards.

PREHEAT AND SEAL YOUR SHELTER
If you are on in an emergency situation, you can take the time to preheat your shelter. You want to seal the interior of your shelter, then place a few candles or a lantern in the centre of the Snow Cave once you have finished it. Light the candles or lantern and then seal the entrance. The heat from will rise and the interior of the shelter will heat up and melt. Because the interior is curved, water will form and flow down the sides and then form a thin ice crust when it freezes. Caution: Do not place your sleeping gear in the shelter while you have a naked flame or lantern burning.
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KEY TIPS

- **TIME**: This shelter requires at least 4ft of snow, more if possible. For a non-emergency shelter, do not build this shelter late in the day as it can take several hours to build.

- **ENTRANCE**: Should be the lowest part of your shelter.

- **AVALANCE**: Snow Caves are commonly built in snow which has piled up against taller objects. Be aware of potential avalanche conditions from above.

- **HEIGHT**: Taller is not better. Do not build your shelter above head height. Tall shelters take more time, energy, and resources to build and take longer to heat up in the winter.

- **HYDRATION**: The act of tunnelling in a small confined space takes time, consumes energy and requires considerable effort which is likely to make you sweat. In winter, sweat will freeze and you are at risk of hypothermia. If you are not in an emergency situation, take frequent breaks, drink water to remain hydrated and try to not overheat and sweat. If you are in an emergency, complete the shelter, climb in and then change into dry clothes as soon as you can – this can be tricky as there may not be much room in your shelter.

- **SHOVEL**: Always keep your shovel or digging device next to you in a snow cave. After a storm you may need to dig your way out.

ADVANTAGES

- Simple shelter to build
- All round protection from the weather
- Robust design provides excellent shelter
- Shelter can last several days
- Easier to build than an Igloo or Quinzee

DISADVANTAGES

- Requires lots of energy to build
- Shelter can collapse if the ceiling of the shelter is too thin.
- The ceiling of a snow cave can drop as much as 1-2 inches per day. This occurs because of normal settling of the snow pack and heat generated from people inside the shelter. During a heavy storm the settling can increase drastically. When this occurs just reshape the inside of the cave.