

Winter Sleeping Systems

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What do you need to sleep in the snow?

- Insulation sufficient to retain an appropriate amount of your body heat during sleep.
- Your metabolism is your only source of heat, and it's lowest energy output is during sleep.
- Padding for comfort and maintaining circulation.

How we loose body heat.

- **Conduction:** Being in direct contact with something colder (ie. the ground or snow).
- **Convection:** Air heated by our skin moves away and is replaced by cold air.
- **Evaporation:** Water in our body evaporates from our skin, taking with it the energy to turn it to vapor.
- **Radiation:** Infra-red light given off by our body radiates away — not significant.

What's a sleep system?

The combination of...

- Clothing.
- Ground insulation: Non-compressable padding.
- Top insulation: Lofty, air-immobilizing materials.
- Wind and water repellent shell.
- Vapor management.

Each component retains a portion of your heat.

Improving any one will keep you warmer, but they all work together.

Clothing

- Any and all clothing you wear to bed adds to heat retention.
- Body parts not covered by clothes (like hands, head) will be colder.
- Try wearing more on your extremities.
- Try to make the thickness or number of layers even or equal over most of your body.
- The more clothing you wear, the colder the air in your sleeping bag will be.

Ground Insulation

- Mattresses are rated by R-value.
- R-5 or better is recommended for temperatures between 30°F and 0°F.
- Full-length is necessary.
- Adding ground insulation is cheaper and more effective than adding other insulation.
- Use one foam and one inflatable for comfort and safety.

Ground Insulation: Pad Types

- Closed Cell Foam:
 - Lightest and insulates best.
 - Relatively indestructible.
- Self-inflating, foam-filled mattresses:
 - More comfortable.
 - May not self-inflate in cold air.
 - Cold spots at contact points.
 - Useless if leaky.

Ground Insulation: Pad Types continued

- ◉ Down or plastic fiber filled air mattresses:
 - ◉ Expensive, but high R-value.
 - ◉ Useless if leaky or punctured.
- ◉ Types **NOT** to use:
 - ◉ Un-filled air mattresses.
 - ◉ Open-cell foam.

Top Insulation

- Typically, a mummy-shaped sleeping bag.
- A fabric shell filled with lofty insulation:
 - Goose down.
 - Plastic fiber-fill (polyester or acrylic).
- Main features affecting warmth:
 - Loft thickness.
 - Draft seals.

Sleeping Bag Choices

	Price	Weight & Packed Size	Moisture Tolerance	Longevity
Down	\$\$	Best	Poor	Lifetime*
Synthetic	\$	Improving	Better	5 - 10 years†

* With proper care.

† Depends on many variables of design and care.

Sleeping Bags: Temperature Ratings

- An over-simplified number that means something different to every manufacturer.
- European manufacturers have to give 4 numbers according to EN-13537: UC=Upper Comfort; CW=Comfort Women; CM=Comfort Men; LE=Lower Extreme.
- US-DOD uses loft thickness:
$$T_{\text{°F}} = 70 - (L_{\text{inches}} \times 25)$$
- Best bet: Compare bags by top-half loft thickness (NOT full loft thickness).

Sleeping Bags: Features & Design

- Draft collars prevent air leakage at neckline.
- Draft tubes insulate the zipper.
- Drawstrings for draft collar and hood.
- Zipper length and placement.
- Sizing: Length, girth, and shape:
 - Larger bag gives more room for layers, but more air volume to heat.
- Shell material: Wind and water protection.

Sleeping Bags: Down Fill Considerations

- Down loft rating is cubic inches per ounce:
750-fill fills 750 cubic inches per ounce of down.
- Amount of "overstuff".
- Tube design: continuous or side-baffled
(ability to shift down inside).

Sleeping Bags: Synthetic Fill Issues

- Dominant insulations: Polarguard, Holofill, Primaloft.
- Polarguard is most widely used; they make several different grades: Classic, 3D, Delta.
- Design: Shingle versus panel:
 - Shingle is heavier and more durable.
 - Panel is lighter and more compressible.

Wind & Water Protective Shells

- Sleeping bag shell materials: Ripstop, Pertex Quantum, Epic, Dry-loft, Gore-Tex, eVent.
 - More expensive, may make it harder to dry your bag.
- Separate Bivy Sack made from these materials.
 - More versatile, but adds weight.

Vapor Management

- Moisture is always evaporating from your body.
- Trapping that moisture with a vapor barrier can keep you warmer.
 - Vapor barriers need to be close to your skin.
 - Clothes inside vapor barriers get soaked.
- That moisture will condense inside your loft.
- If temperatures stay below freezing, you can't dry out your sleeping bag.

Tips For Best Results

- A silk or synthetic-fiber liner can add 5° - 10° warmth for 4 - 8 ounces.
- Store sleeping bag in a water-proof bag.
- Be careful not to spill any liquids on bag (for example, cooking in your tent).
- Dry your bag in mid-day sun if possible.
- Avoid contact with walls of snow shelters.
- Fully-inflate your air mattresses.

Tips for Saving Weight

- Use a right-sized sleeping bag.
- Use closed-cell foam mattresses.
- Layer with warm clothes and a lower-loft bag; consider all your insulation as a system.
- Consider blankets/quilts, half-bags, or nested bags — loft you lie on provides no insulation.

Unconventional Alternatives



Quilts or top-bags.



Half-bags.



Suit/Bag
hybrids.

Sleep Well!