

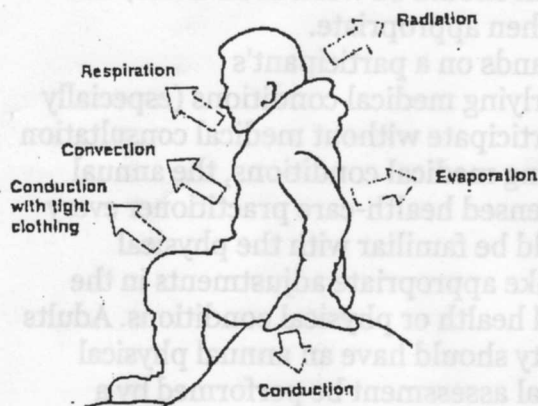
## Cold Weather Basics

### HOW HEAT IS TRANSFERRED

**RADIATION** – a leading cause of heat loss in almost any situation. The head is the most efficient part of the body's radiator system. So rapid is the radiation from the head in a cold situation that heat loss from an unprotected, uncovered head can be enormous. An unprotected head may lose up to one-half of the body's total heat production at 40°F (4°C), and up to three-quarters of total body heat production at 5°F (-15°C).

**CONDUCTION** – Ordinarily, only small amounts of body heat are lost by conduction. But winter campers tend to lose body heat this way more than others do because they often carry metal tools such as a saw, axe, or shovel, and they often rest by sitting on ice, snow, or a cold rock. Climbing ungloved over cold rocks is another mechanism of heat loss through conduction. Conduction of heat from skin to metal is so rapid it can produce an actual cementing of skin to metal, instantly freezing the skin's surface moisture to the metal, with subsequent frostbite or loss of skin.

Wearing thin silk or cotton gloves when handling metal (axe, saw, camera, stove, shovel) protects against this freezing hazard. Handling gasoline or other liquid fuels at low temperatures is especially dangerous. Gasoline stored in a metal canister outside of the tent during a storm will cool



Types of Body Heat Loss

to the lowest temperature attained during the storm. Even covered with an insulating blanket of snow, it cannot rewarm so when it is uncovered, its temperature may be as low as -20° to -40°F (-29°C to -40° C). Spilling such super cooled fluids on your hands will cause instant frostbite. This happens not only from the conduction of heat by cold liquid, but also by the further cooling effect of rapid evaporation of the liquid as it hits the skin. Many cases of severe frostbite occur in this manner.

**CONVECTION** – is an active avenue of body heat escape in the outdoors. By radiation, the body continuously warms a thin layer of air next to the skin to a temperature nearly equal to that of the skin. If this warm-air layer is retained close to the body by clothing, you remain warm. However, if this warm layer of air is constantly being removed by a brisk wind (convection), you feel cool and have to put on more clothing. In short, the primary function of clothing is to retain a layer of warm air close to your body. In conditions of severe cold and wind, you need garments of high wind resistance and insulating qualities.

**EVAPORATION** – The evaporation of sweat from the skin accounts for a substantial loss of body heat. There is very little you can do to prevent this loss. In fact, those in the outdoors are well advised to help the process of evaporation by wearing fabrics that "breathe". If water vapor cannot pass freely through your clothing, it condenses and freezes.

**RESPIRATION** – Inhaling cool air and exhaling warm air accounts for a significant amount of heat loss. This is especially true at high altitudes, at low temperatures, and during heavy exertion. There is little you can do to prevent or conserve this type of heat loss. Your breath helps to warm a tent or snow cave, if you have one, but that's about the extent of its thermal value.