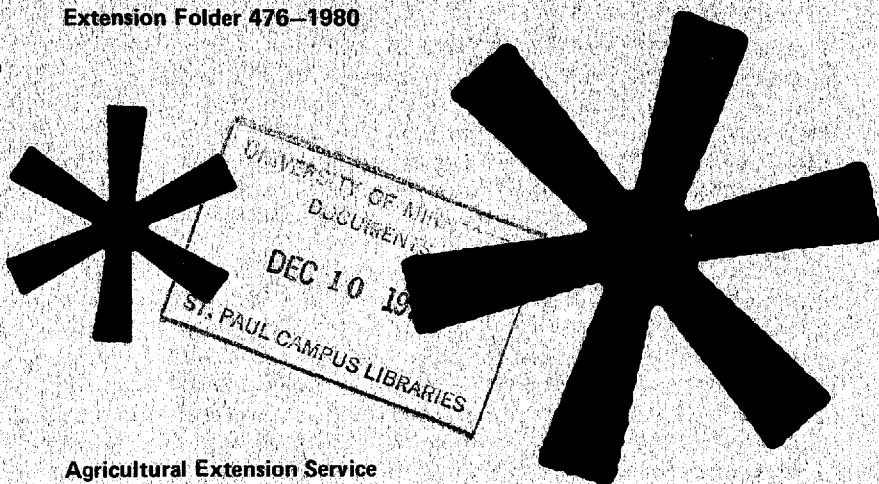


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# Energy Wise Insulated Outerwear Selection and Care

Sherri Johnson

If you are thinking of buying or making an insulated winter jacket, vest, coat, booties, or robe, there's more to consider in keeping warm than meets the eye. With the variety of new outerwear styles, fabrics, inner construction, and insulation, the selection of the appropriate garment or materials needs careful consideration.

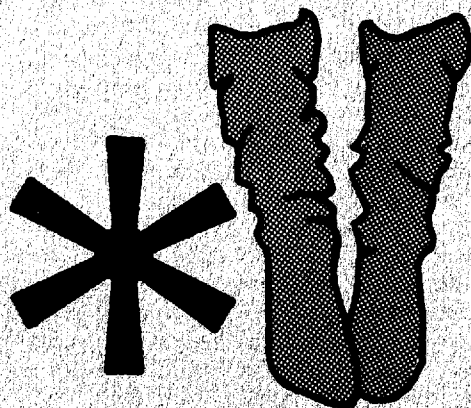
## The Theory of Keeping Warm

No one fiber, fabric, or insulation alone will give you complete warmth in the out-of-doors. The key to keeping warm is how the fiber, fabric, finish, insulation, garment design, and fit combine to trap still air next to the body. This trapped still or "dead" air space provides the necessary thermal insulation to keep you warm. So, as you shop, consider all the facts from fiber to garment fit to determine how they affect the ability to trap the maximum amount of still air around you.

## Fabrics—From Fiber to Finish

The type of fabric you choose for insulated outerwear depends greatly on how you intend to use the garment: for winter camping, snow skiing, running errands, or shoveling snow. Here are some questions to ask yourself:

- In what temperature range will I most often wear the garment?
- For what types of activities will I wear the garment?
- Will I give the garment rugged, active use?
- Will I be exposed to frequent wet or windy conditions?
- How will I care for the garment?



## FIBERS

Fabrics suitable for insulated outerwear should be lightweight, strong, resistant to abrasion, allow for ease of movement, and have low breathability or porosity. A good outerwear fabric must be able to breathe so that perspiration can evaporate while not allowing too much air in or any filling fibers out. Since the outerwear fabric is intended to be combined with an insulation, it need not have the greatest warmth characteristics by itself.

### Wool

For many years wool has been known for its warmth. Because of the structure of the wool fiber, it has an excellent ability for trapping a large proportion of still air around its surface structure which serves as an excellent insulator to keep the body warm. However, it is not commonly used in today's insulated outerwear because of limited strength, an increase in weight when wet, and a restriction to active movements due to fabric surface structure.

### Nylon

Nylon is the most popular fiber used in insulated outerwear today because of its strength, light weight, elasticity, tight weave, and surface smoothness. One limitation of nylon is that it may present a condensation problem. There is less water actually *in* the fabric, but because it stays on the surface it "feels" wetter. However, in spite of this limitation, it is used in many outdoor garments because of its many advantages.

Nylon is usually found in one of two forms: ripstop or taffeta. Both fabrics are tightly woven, lightweight, strong, wind resistant and water repellent.

Ripstop nylon is very lightweight and suitable for outerwear clothing and sleeping bags. It has a grid-like appearance with two heavy twisted yarns woven as one about every 3/16" (5mm) in both directions. This process increases the normal strength of the fabric, however, it is not as strong as nylon taffeta. The standard weight of ripstop is 1.9 ounce per square yard, although lighter weights are available.

Nylon taffeta uses larger yarns in the crosswise direction. This creates a fabric that has better resistance to snags, tears, and normal abrasion than ripstop nylon. Since nylon has a low melting point, keep such fabric away from open flames.

### Blends

Another fabric frequently used in insulated outerwear is a blend of polyester and cotton which uses both fibers to their best advantage. Cotton creates less of a condensation problem than nylon but it may be subject to mildew and rot. When blended together, these two fibers create a strong, water repellent cloth. However, when compared to nylon, this fabric is heavier and takes longer to dry out-of-doors.

A newer fabric developed for outdoor wear consists of a blend of polyester, cotton, and nylon. This fabric combines the lightweight advantages of nylon taffeta with the look and feel of the polyester and cotton blend.

## FINISHES

Water repellent and water proof finishes can affect the comfort and performance of an insulated garment. Avoid selecting garments that are waterproof unless they are to be used as rain gear. To be totally waterproof, a garment is sealed with a coating, such as urethane, preventing any water or air from passing through. If body moisture is not allowed to evaporate, it condenses on the inside of the garment creating a cooling effect on the body, making the wearer chilly. In general, waterproofing is not recommended for fabrics needed for warmth such as insulated winter jackets or sleeping bags. Instead, these fabrics are often water repellent which resists wetting and is relatively breathable.

Within the past several years, industry has been working on the development of waterproof fabrics that are breathable. One such fabric now available is a Gore-Tex film, which is waterproof, windproof, and very breathable. This micro-porous film can be bonded to a variety of types and thicknesses of fabrics for outerwear.

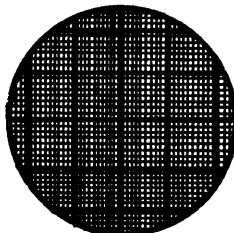
## Insulation

Your comfort and safety in cold weather outdoors depend greatly on how much insulating dead or still air space you are able to put between you and the environment. Today, we have a variety of insulation textile products combined with outer fabrics for use in clothing and other outdoor gear.

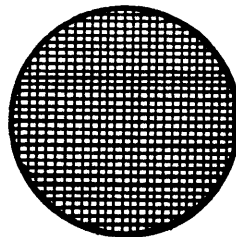
Down is perhaps the oldest and the most well known insulation. More recent developments include several different kinds of polyester fiberfills which are less expensive than down and provide excellent warmth. One of the newest concepts in insulation is a polyolefin called Thinsulate developed by The 3M Company. Because of its microfiber construction it provides greater surface area for holding dead air spaces. Before you buy, consider the characteristics of each and decide which one best meets your needs.

Prime European and Asian goose down has long been considered the ultimate insulator. Down quality is determined by the down pod's ability to hold still air, called cluster or fill power. One factor that indicates the quality of down is the number of cubic inches an ounce of down will fill. Prime quality goose down today runs about 550 cubic inches per ounce and sometimes as high as 700.

The quality of goose down has declined in recent years because the farmers who have been raising geese have never considered it their major product. Geese have always been grown for their food value, while the down is sold as a by-product. In the past, when raised to maturity, goose down has produced large, light, and effective down pods that have excellent insulating qualities. Today, geese are being "harvested" at a younger age for optimum yield of meat against cost of feed. While the geese have been getting smaller, the diameter of the down pods has been shrinking, causing a lower quality of fill power. To compensate for this, frequently low grade goose down is mixed



ripstop



taffeta

with mature duck down and also blended with a small amount of the very rare high quality goose down from mature birds. Because of improved methods of refining duck down, this is an alternative down product available at a slightly lower price. Because duck down has slightly smaller pods than goose down it has a fill or cluster power of approximately 475-550 cubic inches per ounce.

Those advertisements emphasizing "Northern Goose Down" are somewhat misleading. All commercial down is northern. The color of the down is another factor having no effect on the insulating quality. The down from a black goose is just as efficient as that from a white goose. The percentage of down that must be contained in a down product is controlled by federal regulations. In order for a product to be labeled "100 percent down" it must contain at least 80 percent down and no more than 20 percent feathers, dust, or miscellaneous insulation.

The thickness of the down or polyester fiberfill insulation you choose affects the amount of dead air spaces surrounding your body to keep it warm. According to studies conducted by the Army Quartermaster Corps, your body needs different amounts of loft or thickness of down or polyester insulation at different temperatures and rates of activity. The following chart is based on their research and is intended to serve only as a guide. You may find that you require more or less than suggested.

**Thickness of down and polyester insulation (in inches) required for comfort.**

	Effective temperature (°F)					
	40°	20°	0°	-20°	-40°	-60°
	-----inches-----					
Sleeping	1.50	2.00	2.50	3.00	3.50	4.00
Light work	.80	1.00	1.30	1.60	1.90	2.10
Heavy work	.20	.27	.35	.40	.48	.52

The weight per given volume of the insulation can vary from one type of insulation to another. A specific type of insulation may also come in more than one thickness (volume). Presently, the approximate weight of polyester fiberfill ranges from 4-5 ounces (ski wear) to 6-8 ounces (snowmobile wear) and down fibers from 9 ounces (jacket). Manufacturer claims state that Thinsulate provides more warmth per inch of thickness than any other insulator including down. However, when compared on a weight per volume basis, Thinsulate weighs more than down.

Three basic types of insulation are found in outerwear garments and materials for sewing them. Some examples of each type are listed below; \* designates trade name for the product. All are effective insulators, each having its advantages and limitations.

### Insulation in outerwear garments

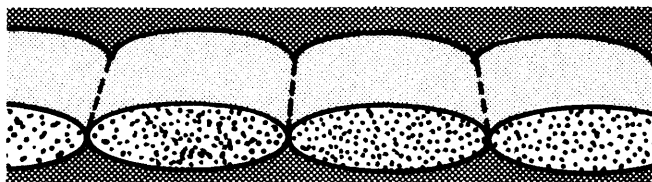
Fiber type *Trade name	Advantages	Limitations	Care (Refer to care label attached to garment)
<b>DOWN</b> Goose	Lightweight Compressible Recovers after compression Durable Breathable, permits body moisture to escape Odorless Non-toxic	Expensive Lumps when wet and loses all insulating qualities Must be quilted to prevent shifting May irritate allergies Dries slowly May mildew if not completely dry when stored Should not be worn near open flame	Pretreat oily stains with mild liquid detergent. Pre-soak 1-2 hours. Hand wash using mild detergent or commercial down soap. Do not use phosphate detergent, enzymes or bleaches. Avoid wringing or lifting if water soaked. Press detergent and water out with fingers. Rinse, squeezing fresh water through until clear. Press out excess water by hand then machine spin-dry. Tumble dry low 15 minutes with clean tennis shoe and towels to prevent lumping. If dry cleaning is desired, air garment to rid of solvent fumes. If machine washed use warm water, delicate cycle.
<b>POLYESTER</b> <i>Fiberfill</i> *Polarguard (continuous filament) *Hollowfill II (staple fiber) *Kodel Pre-quilted fabrics for sewing	Good for wet weather Non-allergenic Fast drying Odorless Resists mildew Maintains loft when wet Will not lump or mat Cheaper than down Polarguard requires minimal quilting Hollowfill II feels like down due to special finish	Slightly heavier than down Should not be worn near open flame Hollowfill II must be quilted to prevent shifting	Polarguard: Pretreat oily stains. May be hand or machine washed using warm water, delicate cycle. Tumble dry low. Remove promptly from dryer. Hollofill II: Pretreat oily stains. Hand wash using mild detergent and warm water. Tumble dry low. Remove promptly.
<i>Needle-punch</i> *Polyslim *Thermoslim	Non-allergenic Good for insulation, inter-lining or padding Gives slim appearance Washable Fast drying Requires little quilting Good for skiwear	Slightly heavier than down Not for extremely cold climates unless combined with additional insulation Should not be worn near open flame	Pretreat oily stains. May be machine washed and dried using warm water, mild detergent, delicate cycle. Tumble dry low or drip dry.
<b>POLYOLEFIN</b> <b>MICROFIBER</b> *Thinsulate	Non-allergenic Resilient Odorless Requires minimal quilting Does not develop cold spots, mat or shift Modifies bulky appearance Fast drying Retains insulating qualities when wet	Slightly heavier than down Should not be worn near open flame	Can be hand or machine washed using delicate warm wash and cold rinse. Tumble dry low, use cool iron if needed. Do not dryclean.

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## Inner Construction

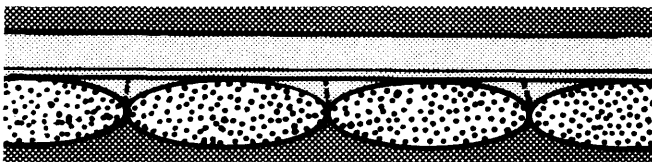
Down and some polyester insulations must be held in place around the garment in tubes or baffles to prevent shifting. The direction in which these tubes run is important. If the baffles are vertical, movement and gravity may cause some insulations, such as down, to settle to the bottom of the garment. Your hips will be warm but there will be no insulation at your shoulders. If the insulation requires quilting, it is best to select a garment with horizontal baffles, or one quilted into squares. Both will hold the insulation in place around the body and from top to bottom. If a garment has vertical baffles, the stitching lines should be spaced close enough together to stabilize the insulation.

Three types of quilting or baffling construction are used in making many insulated garments:



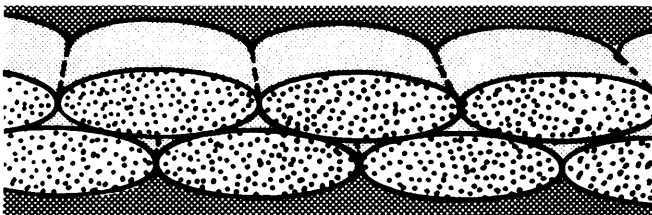
### Sewn-through

This is the simplest and least expensive method. It produces a very lightweight, compressible insulated garment ideal for milder climates, or as part of a layered clothing system in colder temperatures. The insulation is quilted between two layers of lightweight shell fabric. One limitation of this type of quilting is that there are "cold spots" at each stitching line because there is no insulation at that point, and the stitching has made holes in the fabric which may let more air in. Thus, when worn alone, a garment with this type of insulation quilting is not sufficient for *really* cold weather.



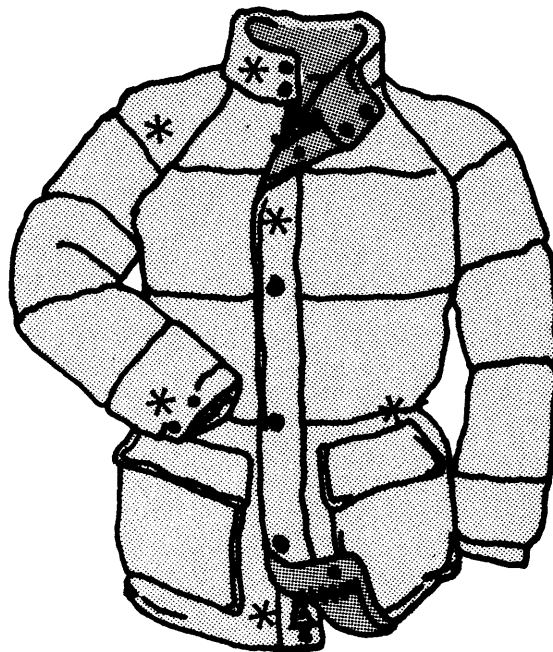
### Triple-layer

This type of construction eliminates cold spots at seams with a fabric layer over a sewn-through layer to trap additional dead air space for insulation. This serves as a wind-breaker as well as provides extra insulation.



### Offset-baffle

This type maximizes warmth with two sewn-through layers placed so that one layer's insulation covers the other layer's seams, thus blocking cold spots. With a shell of lightweight nylon, an offset baffle jacket can provide great warmth yet be fairly lightweight. This type of baffling is used mainly in outer garments intended to be worn in extremely cold weather such as Arctic climates. It is more frequently used as the inner construction in sleeping bags.



## Design Features

For maximum warmth, look for the following design features to help insulate your body in cold weather:

- \* Zippers that open from both the top and bottom have great ventilating advantages. As you become warm, you can unzip from the top and/or bottom to let excess body heat and moisture evaporate.
- \* Storm flaps snap securely over zippers, keep wind or water from leaking in, and provide extra warmth.
- \* Adjustable cuffs aid in ventilation. The wrists are a good place to get rid of excess body heat. Adjustable cuffs can be loosened or opened when the wearer gets too warm. Cuffs with fasteners such as pressure tape, snaps, or buttons are a good choice.
- \* Drawstrings at hood and waist will keep out cold air and allow for ventilation when desired.
- \* Neckbands or collars that can be turned up to keep out chilling winds should be considered.
- \* Raglan sleeves eliminate shoulder top seams that might collect rain or snow, or create a cold spot. They also allow for greater freedom of movement.

The size and fit of the outer garment you choose also affects how warm you'll be. It should be large enough to wear several layers of winter clothing underneath. A jacket that fits too tightly may compress the insulation and not allow for maximum warmth. When selecting an insulated jacket for daily use, also consider the length of the garment. A hip length style will be warmer than a waist length one.