

Out in the Cold

Gearing up for cold-weather construction

by Scott Schuttner

In Fairbanks, Alaska, where I build custom houses year around, the winters are long and frigid. Trees shed their leaves in mid-September and the snow starts to stick early in October. Temperatures can plunge below zero by Halloween and can linger around -30° F to -40° F anytime before mid-April.

There are plenty of good reasons to go into hibernation until the spring thaw, but there are compelling reasons to keep working. A steady income is one of them. If you're an employer, you'll also want to keep your crew busy year around or risk losing them to builders who will. You can also avoid running double shifts and paying overtime in the summer to finish up projects before cold weather arrives. Lastly, some projects are done more easily and efficiently in the winter, such as the transporting of materials to remote sites over frozen ground instead of mud.

If you're planning to work in this kind of weather, though, you'll need to winterize your tools and your body first (photo, facing page).

Winterizing your power tools—My power tools usually ride to work on the floor of my truck while the heater blows on them. Once my worm-drive saw is warm, it will do fine as long as it's being used. If I allow it to sit for an hour or two, though, it will need to be warmed up again. A dead-cold saw at -20° F can take at least a half hour to work properly, so plan ahead and try to do as much cutting at one time as possible. Storing the saw near a space heater between cuts is great, but beware of getting too close; a melted saw is not a pretty sight.

A lot of carpenters, including me, use a low-viscosity gear lube in their worm-drive saws. I use Frigid-Go, a synthetic oil made by Quantum Chemical (Emery Division, 11501 Northlake Dr., Cincinnati, Ohio 45249). You can also thin the gear lube with kerosene. This can be a big help in a pinch, but will eventually result in leaky seals that require replacement. Thinning with kerosene will also require that the level of the gear lube be checked on a regular basis. Some carpenters winterize the bearings in their saws. My worm-drive saw has two sealed bearings on the motor's armature shaft and two more on the arbor assembly. For a cost of from \$30 to \$50, our local service center will replace them with unsealed bearings that can be lubed with a grease made for cold weather,

such as Lubriplate Cold Weather Lube (Fiske Bros. Refining Co., 129 Lockwood St., Newark, N. J. 07105). You can also change the bearings in the rest of your power tools, but don't put unsealed bearings in tools that produce a lot of fine dust, such as belt sanders. The dust will work its way into the unsealed bearings and wear them out quickly. Any bearings that are changed have to be changed back in the spring, so this can get expensive. Also, changing the bearings in a power tool will sometimes void the warranty, so you may want to check with your dealer first.

A lot of power miter boxes use a rubber or plastic drive belt. With the usual fast starts and stops, I've seen a lot of these break at below-freezing temperatures. Keep a spare.

If you use cordless tools, keep the batteries in a warm place until you need them. A battery stored below zero can lose up to two-thirds of its normal output between charges. The inside pocket of the coat you're wearing is a handy place to store a battery on site. Also, don't recharge batteries in temperatures below 40° F or they won't take a full charge.

I usually keep my radial-arm saw outside, so I installed a twist-lock connector between the switch and the cutting head. A twist-lock connector is a pair of three-prong plugs with curved blades and slots that lock together with a twist so they won't come apart under tension. The twist-lock allows us to unplug the cutting head, slide it off the track and store it in a warm place until we need it. Be sure to install the twist-lock so the male end is on the cutting-head side. That way, you'll never have electrically hot prongs exposed to the touch.

Repeatedly bringing a power tool from a cold environment into a warm and moist one will cause internal condensation and corrosion. Warm up all of your power tools for several hours a day so they'll dry out thoroughly.

Condensation creates mischief with compressors, too, especially when it ices up in the tanks and hoses. A local distributor here sells an in-line antifreeze injector under the brand name of No-Tox (Norgren, 5400 S. Delaware St., Littleton, Colo. 80120). The injector costs about \$60, and a gallon of No-Tox antifreeze costs \$23. This is an expensive measure, but it solves the problem of frozen nailers and staplers. Gas line de-icing liquids, which contain methanol (the kind you buy at gas stations)

are sometimes poured into nailers or tanks, but this will lead to disintegrated rubber O-rings in the guns. Compressor tanks should be drained daily, and the pumps should operate on the appropriate oil for the season. I use Lubriplate 10W compressor oil. The best idea is to keep the compressor itself in a warm area, but you'll still need the antifreeze injector to prevent the lines and air tools from icing up.

Another problem I've had with pneumatic nail guns and staplers in cold weather is the breakage of driver blades caused by dry-firing (firing the gun when the nail magazine is empty). I've also had trouble with the internal rubber bumpers because they become brittle and can fail in extreme cold. Keep the guns in a warm place when they're not being used.

Extension cords were a real problem in cold weather until the advent of arctic-type wire insulation. The old cords would get as stiff as a piece of pipe and would crack in cold weather. Now you can buy extension cords that are flexible even at -40° F. The type I use is manufactured by the Carroll Cable Company (Box 68, 249 Roosevelt Ave., Pawtucket, R. I. 02862). Although these cords typically cost about 50% more than regular SJ (oil resistant) black rubber-cords, around here they're the only type sold for outdoor use. The only drawback is that a few brands I've used aren't as flexible when they're warm as standard cords are and can be tough to coil.

Don't forget your other tools—Hand tools also require special attention. Holding onto a hammer handle (or anything else) with gloves or mittens is easier if you wrap the handle with friction tape. Without exception, ladders need to be secured at the bottom, or they'll slip on the ice. Automobiles and trucks aren't usually considered tools, but most builders will tell you otherwise. In Fairbanks, motor vehicles and all other water-cooled engines require annual winterizing. This includes changing to cold-weather engine oil, gear lubes and hydraulic fluids, repacking the wheel bearings and adjusting the antifreeze mixture. Diesel engines might require switching grades of fuel and fuel additives if it's cold enough. It is essential to have a functioning engine-block heater in our climate. The heater I use is made by Five Star Manufacturing (702 E. Tallahatchie Ave., P. O. Box 1148, Clarksdale, Miss. 38614). It's an electric thermosiphon heater

about the size of a can of tennis balls that's placed in-line with a heater hose between the low and high point on the block. I have to plug it in for one to four hours when temperatures drop much below zero.

You can also get pan heaters for the oil pan and electric-battery blankets to keep batteries toasty. Several local agencies such as the Co-operative Extension Service (University of Alaska, Fairbanks, Ak. 99701) have publications for winterizing every part of a truck, but what's realistic falls somewhere between the ideal and just getting to work tomorrow.

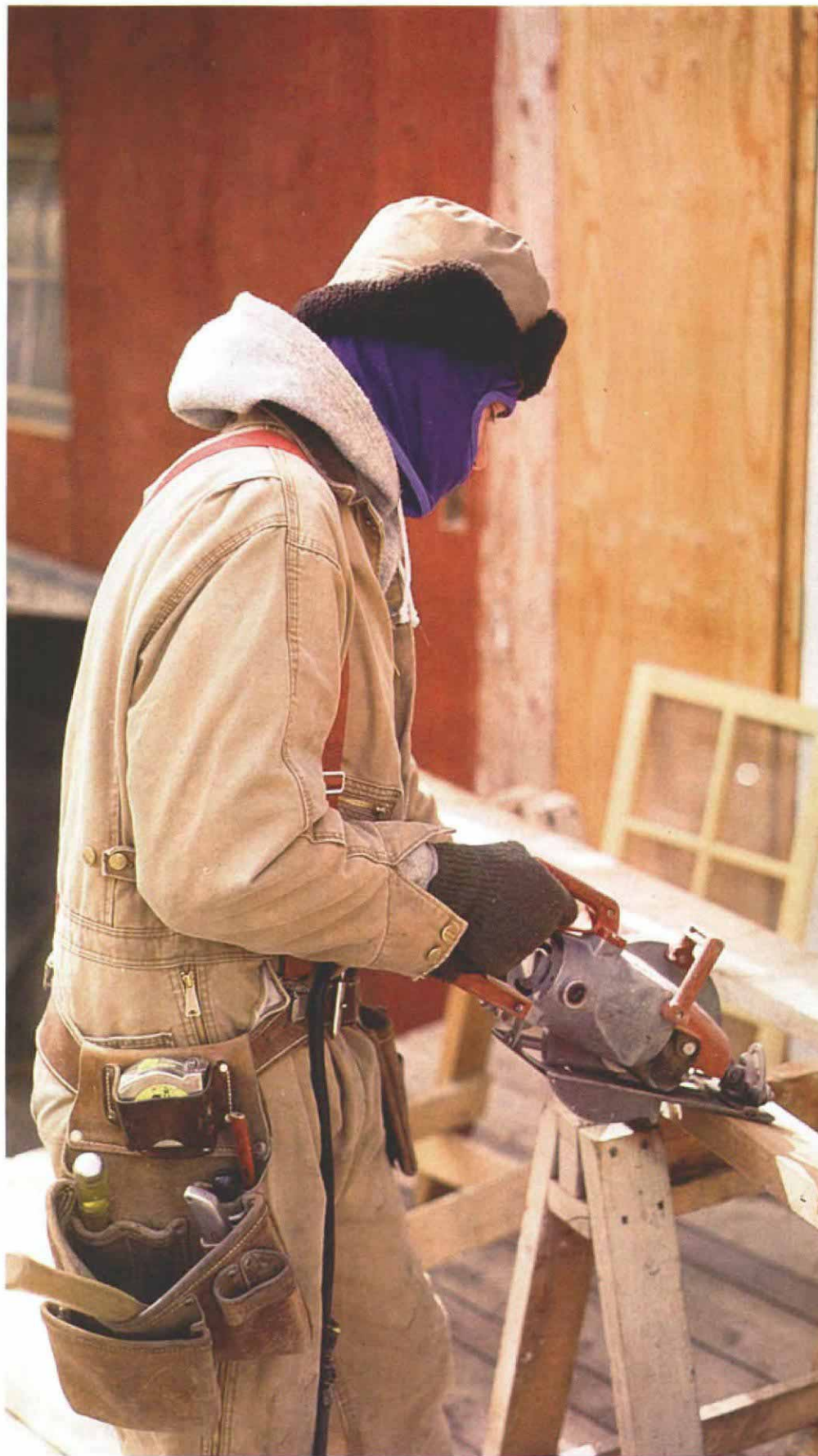
Health and safety—People have a much more complex and individualized reaction to the cold than do pistons and ball bearings. Fortunately, new materials have been developed for cold-weather clothing, and plenty of studies have shown how builders can avoid problems while working outside.

Things go pretty smoothly down to about 10° F. But, in my experience, tasks take about four times as long at -20° F, and it's tough to get anything done at all at -35° F. If you're working with a crew, decide on the minimum temperature at which you will start work the next day, then have everyone listen to the same radio station and weather report to determine whether or not he or she should show up on the job site.

Trouble begins the moment your body starts to lose heat faster than it produces it. Start moving around while you wait for your partner to cut that board. Stay active or your body will try to compensate for the loss of heat by shivering, and shivering is a clear warning that you're too cold. It's time to move more vigorously, put on more clothes to slow heat loss or take a break. Go get warm somewhere and drink warm liquids. If you ignore shivering, it can lead to hypothermia as the body's temperature begins to fall (top chart, following page). This will affect your reasoning ability and make working with tools more hazardous. Hypothermia will also reduce your muscle control and can lead to unconsciousness or even death. Vigorous exercise can keep a person warm down to about -20° F without the need for extra-heavy clothing, but this assumes that the person is dry and well-fed. Excessively hard work can lead to exhaustion and rapid hypothermia.

It is possible to freeze exposed parts of your body without actually feeling cold overall. This is called frostbite and it's most common on the fingers, face and toes. Fingers and toes which are first painfully cold and then gradually stop hurting are probably frostbitten. Little pale patches on the nose and cheeks also signify frostbite. Frozen cheeks don't hurt until they thaw out. Minor frostbite is relatively common around here, and the victim is usually made aware of his condition by another person's observation. The buddy system, where two workers keep an eye on each other, works well.

Windchill increases the risk of both frostbite and hypothermia. Windy weather can whisk heat away from your body as fast as colder,



Winter construction in cold climates demands proper clothing and some modifications of tools. The best way to keep warm is to wear several layers of clothes. Here, a sweatshirt, insulated overalls, army-liner gloves, insulated hat and a polypropylene face mask called a balaclava help to keep the author nimble. As for his saw, special gear lubes and preheating help to keep worm-drives operable.

Summary of major winter-related injuries

Injury	Symptoms	Treatment	Prevention	Remarks
Frostbite (tissue freezes)	Skin turns white. Tingling sensation in affected area. Dull pain and eventual numbness. Loss of flexibility.	Light frostbite can be treated by warming the affected area with body heat. If deeply frozen, do not attempt to thaw but get medical assistance as soon as possible. Do not rub with snow or attempt rapid defrosting.	Proper clothing. Buddy system. Don't touch metals or liquids with exposed flesh in below-freezing temperatures.	Common on face, fingers and toes.
Hypothermia (body loses more heat than it produces)	Mild depression. Lack of enthusiasm. Fatigue. Difficulty walking. Shivering. Inability to do simple tasks.	Replace wet clothing with dry. Drink warm liquids. Increase body heat with another's body heat in sleeping bag.	Proper clothing. Remove layers of clothing as needed to avoid sweating.	Can cause stupor, coma and even death.
Carbon monoxide poisoning (deprives body of oxygen)	Dizziness. Headaches. Affected vision. Sleepiness. Vomiting. Unconsciousness. Skin turns red. Nausea.	Mouth-to-mouth resuscitation. Take to fresh air immediately. Keep warm. Get medical attention.	Provide adequate ventilation at all times. Keep unvented heaters outdoors.	Don't sleep in running cars or use unvented heaters.
Snowblindness (UV rays from the sun burn the eyes)	Headaches. Watery, burning, swelling and redness of eyes. Scratchy eyelids.	Rest in darkened room with bandages over the eyes to limit painful movement. Eyes should heal within a few days.	Wear protective glasses, even on overcast days.	Symptoms may be delayed up to 12 hours.

calmer weather. Windchill charts compare windy-day temperatures to their calm-day equivalents (chart, below).

Wear warm clothing—The best advice for keeping warm is to wear several layers of clothing. This will allow you to shed clothes or to add them according to the temperature and the demands of the job. Too much clothing, however, will cause you to perspire, which will greatly decrease the insulating value of your clothes.

For the upper body, a number of thin layers are more effective than a few bulky ones. Look for long underwear that is made from a blend of wool and cotton. Wool will retain its insulating properties even when it's damp from perspiration. A good alternative to wool is a synthetic insulating cloth made of either polypropylene or polyester. Add a flannel or wool shirt or a sweatshirt over the first layer of wool or poly, an insulated vest over the shirt and an outer layer of clothing such as coveralls. The vest will help to keep your upper body warm without adding unnecessary bulk around your arms.

My experiences with goose-down jackets on the construction site have been leaky ones. Although down is one of the best insulators around, it loses effectiveness when wet. It continually puffs out of nail-torn clothing and doesn't stand up to frequent washings. A synthetic insulating material such as DuPont's Hollofil will last much longer, and it's easier to take care of. Outdoor-recreation catalogues such as L. L. Bean, Inc. (Cosco St., Freeport, Me. 04033) and Patagonia, Inc. (259 W. Santa Clara St. Ventura, Calif. 93001) are a good place to shop for all this stuff.

My choice for the outer layer is a pair of insulated coveralls (Carhartt Mfg. Co., One Parkland Blvd., P. O. Box 600, Dearborn, Mich. 48121). Long leg zippers make them easy to put on over boots and the one-piece unit keeps drafts from stealing your heat. The outer canvas layer is tough and lasts for years. You can also buy a detachable hood that snaps onto the collar to keep wind and snow off your neck. These coveralls, along with work pants, provide all the insulation I need for my legs.

Synthetics should be used with caution as an outer layer. Although they're good for breaking the wind, they melt easily when they

accidentally touch hot surfaces such as heaters. They are also somewhat difficult to repair.

You've probably heard that 75% of your body heat can be lost through the top of your head. I believe it. A good stocking cap or an insulated hat with ear flaps is a must. On very cold and windy days a lightweight face mask made from polypropylene, called a *balaclava*, can be useful. There's also Carhart's detachable hood, which can easily be flopped down when you become too warm.

Boots—There are two basic types of winter boots used here in Fairbanks (bottom photo, facing page). One type is called a shoe pack. My favorite shoe pack is made by Sorrel (Kaufmann Footwear, P. O. Box 90005, 410 King St. West, Kitchener, Ontario, N2G 4J8, Canada) and costs about \$60 to \$70 a pair. Shoe packs are insulated with a removable, thick felt liner, and extra felt insoles can be added to increase warmth. These liners need to be removed and dried out daily. Also, the boots have a rubber bottom to keep your feet dry in slushy conditions. The main advantage of these boots is that an extra pair of socks can be worn without pinching your feet and slowing down circulation. I wear a thin-silk inner sock (silk is a good insulator) and a thick-wool oversock. Other socks are available with battery-operated heating elements, but I suspect I'd find myself underpowered more often than not.

The other type of boot that's common in Fairbanks is what everyone around here calls a "bunny boot" (BATA Shoe Co., Inc. Industrial Footwear Division, 4501 Pulaski Hwy., Belcamp, Md. 21017-1799). These are Army-issue

Windchill factor

Cold temperatures accompanied by wind can have the same effect on the body as colder temperatures alone. Windchill increases the risk of both frostbite and hypothermia.

Temp. at	Windchill factor at			
0 mph	15 mph	30 mph	40 mph	
30	11	-2	-4	
20	-6	-18	-22	
10	-18	-33	-36	
0	-33	-49	-54	
-10	-45	-63	-69	
-20	-60	-78	-87	
-30	-70	-94	-101	
-40	-85	-109	-116	

Wind speeds greater than 40 mph have little additional chilling effect.

boots with a layer of rubber inside and out, and with layers of felt sandwiched in the middle. I've never heard of cold feet in these boots (they're designed for temperatures down to -70° F), but I've never liked the idea of sealing my feet all day in these without ventilation. They're available in Army-surplus stores in Alaska for about \$80, or they can be purchased new for about \$160.

There are also plenty of insulated leather boots on the market, which are usable in moderate temperatures. Leather boots with seams and welts should be kept well sealed. Use something that won't degrade the leather or stitching, such as Snow Seal (Atsko Inc., 2530 Russell S. E., Orangeburg, S.C. 29115). Heavy-lug soles provide good traction in snowy conditions but tend to be slippery on ice. They also track snow and mud onto finished floors, which won't make you too popular with your customers. That's why I opt for smooth soles. By the way, all polyethylene scraps on the job site should be picked up because there is nothing more slippery than poly on ice.

A stiff sole is important for avoiding sore feet when standing on a ladder all day. If you use shoe packs, an easy way to stiffen the soles is to add felt insoles that come with a steel shank.

You'll want to avoid most steel-toed boots in frigid weather—most of them invite frostbite. There's at least one steel-toed boot on the market, though, that won't cause cold feet. Made by LaCrosse Footwear (P. O. Box 1328, LaCrosse, Wis. 54602), it's a shoe pack with the steel toe buried between layers of felt inside the boot to insulate it from your feet.

For flexible fingers—Keeping your hands warm while retaining the ability to manipulate tools and materials can be a big challenge. Mittens work best, but only when the task doesn't require fingers. My all-time favorite glove is an Army-issue called a "liner" (photo above). Made from a wool-synthetic blend, these are inexpensive (\$4), wear well and offer warmth even when they're damp. The best place to look for them is in surplus stores. Polypropylene is a good material, but poly gloves don't wear as well as the liners because they're thinner. They're more expensive (\$6), too. You can find them in sporting-goods stores. To make gloves easier to use, you can snip off several fingertips (from the glove, that is), or you can buy a pair of wool rock-climbing gloves—they don't have fingertips in the first place. All these thin gloves need to be babied and used only when dexterity is required, otherwise you'll wear out a pair a week. Cotton work gloves are seldom used in cold weather because they're worthless when wet and only slightly better when dry.

One helpful technique for keeping your fingers warm is to heat up bulk nails with a space heater or other heating equipment on site and then load up your tool pouch with warm nails. Then you can just stick your hands in your pouch to warm them up. Exchange cold nails in your pouch for warm

ones as often as needed. We also buy little packets of phase-change salt from our lumberyard for about \$2 each. They provide heat when crushed and stay warm for hours. Store these in the end of a mitten or inside your glove on the back of your hand.

When temperatures are below zero, beware of touching metal with your bare hands, especially if they are wet. They will stick to the metal instantly.

Added precautions—No matter what type of clothing you begin the day with, it usually won't work for the whole day. You'll need to carry different boots, gloves and coats to meet the changing conditions. The front seat of my truck often looks like a messy closet.

All this clothing and head gear tends to limit your hearing and peripheral vision. Beware of heavy-equipment operators and others who may not see or hear you, either. Low light levels in winter and snowy conditions also contribute to a higher accident rate due to poor visibility. Wear reflective tape in high traffic areas.

On sunny days I find sunglasses to be essential. The glare reflecting off the snow is not only uncomfortable, but the excessive dose of ultra-violet radiation can cause temporary damage to the eyes called snowblindness. The image of a dog musher wearing wooden glasses with small horizontal slits in them comes to mind. These slits minimize the amount of reflected radiation that reaches the eyes. Nowadays, good sunglasses can block most of the UV light. I prefer green or gray lenses. I've used Bausch and Lomb "Ray-Ban" sunglasses for years, but there are lots of other good brands readily available.

I noted earlier that staying well fed will help you to beat the cold. Don't take this lightly. Eat a high-calorie diet that's high in carbohy-

drates; they provide a quickly accessible reservoir of energy. I start off the day with a bowl of oatmeal and prefer hot soup and a sandwich for lunch. Between meals, I munch on trail mix (a blend of nuts, raisins, seeds and grains). Nicotine will cause blood flow to be restricted, and blood circulates warmth. Alcohol, which has no place on the job site anyway, will dilate the blood vessels, causing increased heat loss from the body. Some people have a tendency not to drink enough liquids when they're outside in the cold and actually get dehydrated. So remember to bring a thermos and pour yourself a cup of warm liquid at break time. It will also give you something warm to wrap your fingers around.

Each individual has a unique response to the environment. What may be comfortable to somebody else may seem intolerable to you. Use your own judgment and don't push yourself when you don't feel right. □

Scott Schuttner is a contractor and woodworker in Fairbanks, Alaska. Photos by the author.



Builders in Fairbanks favor either of two different types of winter boots: "bunny boots" or shoe packs. Pictured from left to right in the photo above are BATA "bunny boots," LaCrosse steel-toed shoe packs, Sorrel shoe packs and removable felt liners, which insulate the shoe packs. All these boots have rubber soles to keep feet dry in slushy conditions. Keeping hands warm and functional can be a big challenge. When dexterity is required, these thin gloves shown in the top photo work best. The green glove, called a "liner," is a wool-synthetic blend that keeps hands warm even when it's wet. The blue polyethylene glove is warm but isn't as durable as the liner. The gray glove is a wool rock-climber's glove; the missing fingertips improve dexterity.