If your employees must work outside during harsh winter weather conditions, then special steps must be taken to protect them from the cold and wind.

*by Sandy Smith*

When working in severe winter conditions, sometimes you just have to say no, insists Lonnie Baldwin, director of Safety for Washington Group International's (WGI) Power division, which builds power plants around the world. "When there's a -45 Fahrenheit wind chill, then you should only do emergency work," he says. "Some days, regardless of how much work needs to be done, employees cannot be outside."

Baldwin should know: WGI – named one of America's Safest Companies in 2004 – has thousands of employees on construction projects around the world, many of them in cold climates, including that proverbial icebox, Siberia.

"We have 1,000 workers building a power plant and clean air systems in Wisconsin," Baldwin adds, "and it gets pretty cold up there, too. We'll have 3,000 workers up there within the year, and cold weather safety is important."

He says WGI does so much work in both hot and cold climates that it has a policy to deal with work in temperature extremes. "We make sure employees and supervisors understand the effects cold and heat can have on them," he says. "Work in extreme temperatures can be fatal."

Baldwin compares such work to that in any other harsh environment, such as one involving chemical hazards or confined space entry. "We take readings – measure temperature and wind velocity – and decide how to proceed," he notes, adding that such precautions are really no different than monitoring for gas or vapors in a potentially dangerous work environment. And, he adds, working in extreme cold should be treated with as much caution and respect for hazards as in any other potentially fatal work environment.

**Training for Supervisors and Employees**

WGI supervisors and employees are educated about the impact of cold on the body and the danger signs to look for – changes in skin color, disorientation, drowsiness – when working in extreme cold.

For example, a pale appearance in fingers, toes, cheeks or noses that should be rosy from the cold can be an indication of frostbite. Another symptom of frostbite is loss of feeling in extremities.

More severe reaction to cold is called hypothermia, which occurs when the body temperature drops to less than 90 Fahrenheit. Symptoms of hypothermia include uncontrollable shivering, slow speech, memory lapses, frequent stumbling, drowsiness and exhaustion.

WGI trains employees and supervisors on proper first aid for workers who show signs of frostbite or hypothermia. They are taught to move the ill worker to shelter, begin warming the person slowly and seek immediate medical assistance. The body – neck, abdomen, chest and groin – should be warmed first. Warming arms and legs first can force cold blood to circulate through the heart, which could lead to heart failure. Employees are told to give the worker warm, sweet drinks if he is conscious.

During training, employees are taught how to dress for cold weather. "They need to dress in layers. First, a layer of cotton, to wick moisture away from the body. Then wool, for its insulation properties. Then, nylon or Gore-Tex, to protect them from wind. We tell them to wear insulated head coverings, gloves and boots. On most of our jobs, we provide them with insulated gloves," says Baldwin.

Employees are counseled to avoid alcohol and smoking when in extreme cold. "It constricts blood flow to the skin, and can contribute to frostbite or hypothermia," Baldwin notes.

Offering guidance about proper clothing is only about one-third of the company's efforts to educate and protect employees working in extreme cold. As with any hazard, the company relies on engineering and administrative controls to help protect employees.

**Hierarchy of Controls**

As any safety manager knows, personal protective equipment is the last line of defense against a workplace hazard. Engineering and administrative controls are the preferred way to control or eliminate dangerous situations.
WGI has incorporated a number of engineering controls into its cold weather work environments. Baldwin says the company uses radiant heaters to warm workers, places insulated handles on equipment and constructs shields to protect workers from wind.

Administrative controls include educating employees about proper clothing and providing them with a warm area (65 Fahrenheit) to change clothing and take breaks. Workers are told to drink plenty of liquids to avoid dehydration, which can be just as much of a danger in cold weather as in hot weather. Outside work is scheduled, whenever possible, for the warmest parts of the day.

Employees are also encouraged to take part in warm-up stretching sessions before starting their shifts, a proactive step applauded by Dr. Donald Condit, M.D., a clinical assistant professor at Michigan State University and an orthopedic surgeon in Grand Rapids, Mich. "Workers are more likely to sustain muscle strains and sprains when they are out in the cold and haven't taken time to warm up their muscles," he points out.

Condit notes that in his practice, he sees a number of workers who have been injured by slips and falls on icy surfaces, or who have lost fingers or thumbs after sticking their hands into snowblowers they thought were turned off. "They turn off the snowblower and stick their hands in to clear heavy snow that's jammed in there. They don't realize the machine has a couple of extra rotations," he says.

He advises workers who have sustained a broken bone or suffered a strain injury to be aware that cold weather could cause additional pain or stiffness. "The stiffness goes away after about a year," he says, "but in the meantime, be aware that you will have increased sensitivity to cold."

Baldwin says WGI supports the concept of self-determination for employees working in the cold. They are encouraged to come to supervisors when they believe they are becoming too cold. The supervisors will either send that employee to another area to warm up, or call a break for all employees so that everyone can warm up. The company also utilizes a buddy system for working in temperature extremes. Employees are expected to step in if they perceive that a coworker is exhibiting symptoms of frostbite or hypothermia.

"Employees are taught and told to look for symptoms of cold-related illness," says Baldwin, "and it is a supervisor's responsibility to get that person to safety, whether it's loading him into a pickup truck and taking him to a warmer area or a full-blown rescue."

The point is, says Baldwin, "Employees will do what supervisors ask them to do. That's why we have a written policy and procedures for working in the cold. If you have too many people making decisions, then employees get injured."

Written Procedure

The WGI procedure for working in extreme temperatures applies to all WGI employees and subcontractors who are involved in work environments that have the potential to cause heat- or cold-related injury or illness. Much of the information contained in the procedure was taken from the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) for Chemical Substances and Physical Agents under the section on "Thermal Stress." The procedure outlines the duties and responsibilities for every employee involved in a project – project manager, site manager, project engineering manager, project safety manager, project radiological manager, project training coordinator, project medical consultant and WGI employees and contract employees – where extreme temperatures are a concern.

For example, the project safety manager (PSM) is responsible for providing assistance to supervisors in conducting hazard evaluations of the work environment for heat and cold stress; ensuring proper instrumentation is available to conduct the evaluation as needed; providing assistance to supervisors in recommending and implementing countermeasures, and providing hazard awareness to project personnel conducting WGI work-planning operations. The project radiological protection manager works with the PSM to provide guidance for contamination control where instrumentation is utilized for monitoring of hot and cold environments, and to provide assistance to supervisors in selection and implementation of countermeasures for hot and cold environments in radiological controlled areas. It is the responsibility of WGI employees to become familiar with heat and cold stress and their causes; to practice recommended guidelines when directed to do so by supervisors; to recognize signs and symptoms of heat and cold stress; and to inform supervisors of any physical condition that may reduce tolerance to work in extreme temperatures.

The procedure defines heat and cold stress and their symptoms, outlines physical conditions that can contribute to heat and cold stress, offers engineering and administrative controls, and provides information about wind chill and a work/warm up chart for work shifts.

The chart, which comes from the ACGIH, takes such elements as wind velocity and temperature into consideration. "For example, if there's no noticeable wind and the temperature is -25 to -29 Fahrenheit, then the maximum time
spent outdoors should be 75 minutes with two breaks of 10 minutes each," says Baldwin. "If the wind is blowing at 10 mph, then the maximum work period is 40 minutes, with four, 10-minute breaks."

All non-emergency work ceases if it is -45 Fahrenheit with zero wind. When the wind is blowing at 20 mph, then non-emergency work ceases when it is -25 to -29 Fahrenheit.

WGI supplies wind velocity gauges and thermometers for all projects that cannot rely on local weather reports. "It's part of the essential equipment they need to do the job," says Baldwin.

Having a written procedure is important, he adds, "because you can't make good decisions based on personal opinion. We rely on the employees to tell us when they're getting too cold, but other than that, there is a science to this and we use it to ensure employees are not injured."

"Working in extreme cold and heat are just as dangerous as any other work hazard, and we treat them that way," Baldwin notes.

Sidebar

Employee Safety Primer: Winter Driving

The leading cause of death during winter storms is transportation accidents. Preparing vehicles for winter weather and training employees to know how to react if stranded or lost on the road are the keys to safe winter driving, says the Minnesota/Iowa AAA.

Before Driving

"Millions of vehicles in this country are in need of preventive maintenance before the weather turns colder," says Jeff Ogden, AAA Minnesota/Iowa president. "Having an inspection conducted by a qualified technician can catch those services that can be done now, instead of being faced with a bigger, more expensive problem later."

- Have a mechanic check the battery, antifreeze, wipers and windshield washer fluid, ignition system, thermostat, lights, flashing hazard lights, exhaust system, heater, brakes, defroster and oil level (if necessary, replace existing oil with a winter grade oil or the SAE 10w/30 weight variety).
- Install good winter tires and make sure the tires have adequate tread. In many states, all-weather radials are adequate for most winter road conditions. Some jurisdictions do require that vehicles must be equipped with chains or snow tires with studs, so contact your local state police to determine what is required in your area.
- Keep a snow scraper and small broom in the vehicle for ice and snow removal.
- Try to maintain at least a half tank of gas during winter months.
- Listen to weather reports for the latest road conditions. Travel during daylight, if possible. When driving in severe winter weather conditions is unavoidable, try to send at least two people.
- Dress warmly. Wear layers of loose-fitting, layered, lightweight clothing.
- Carry food and water. Store a supply of high-energy snacks such as canned nuts and several bottles of water.
- Carry flashlights with extra batteries, a first aid kit with a pocket knife, any vital medications, blankets, matches, extra clothing (mittens, socks, hats, rain gear) and a brightly colored piece of cloth to use as a flag.
- Carry sand or kitty litter for generating traction under wheels and keep a small shovel, tools and booster cables in the car.

While Driving

When driving during slippery and icy conditions, slow down and keep a safe distance from other vehicles, minimize brake use and remember that traction is greatest just before the wheels spin. Gentle pressure on the accelerator pedal when starting is the best method for retaining traction and avoiding skids. The most effective way to stop on ice and snow is to apply brakes gently. With an antilock braking system (ABS), a vibration or pulsation will be felt in the brake pedal when coming to a stop. This means the system is operating as designed to prevent wheel lock up. Do not pump your brakes if your car has ABS.

In addition, advise employees to keep seatbelts fastened and make certain that all passengers are securely restrained. When driving in falling snow or fog, lower speed, use low-beam headlights or fog lights, and keep a safe distance from the vehicle in front.

Trouble on the Road
Advise employees that if they get caught in a blizzard, they should stay in the car. They should not leave the car to search for assistance unless help is visible within 100 yards. They may become disoriented and lost in blowing and drifting snow.

They should display a trouble sign, such as a brightly colored cloth on the radio antenna, and raise the hood of the car.

Employees should be told to occasionally run engine to keep warm. To do this, they should turn on the car's engine for about 10 minutes each hour and run the heater while the car is running. Also, they should turn on the car's dome light when the car is running.

Caution employees to be aware of carbon monoxide poisoning. The must keep the exhaust pipe clear of snow, and open a downwind window slightly for ventilation.

They should watch for signs of frostbite and hypothermia and do minor exercises to keep up circulation. These exercises can include clapping their hands and moving their arms and legs occasionally. They should try not to stay in one position too long, but must be careful to avoid overexertion, because cold weather puts an added strain on the heart.

If more than one person is in the car, they should huddle together for warmth and take turns sleeping.

Sidebar

Cold Weather and Cardiovascular Disease

Cardiologist Dr. Richard Stein has a word of caution about winter: it can be very hard on your heart. According to Stein, who serves as a spokesman for the American Heart Association (AHA), people tend to do substantially more work in the winter than they are accustomed to doing in warmer months, and that can prove deadly.

"In the summer, it's hot and we know not to get dehydrated or too warm. In the winter, since it's not hot, we don't realize how hard we're working when we're outdoors," he notes.

He recommends that people who are outdoors in cold weather avoid sudden exertion, like lifting a heavy shovel full of snow, unless they are accustomed to physical labor. Even walking through heavy, wet snow or snowdrifts can strain the heart. "If you are not used to exercising during the rest of the year, then certainly, in cold weather, do not increase your workload outside," he counsels. In addition to the extra exertion placing a strain on the heart, the heart must work harder to circulate blood in cold weather, Stein says.

And, he adds, inhaling cold air can temporarily narrow arteries, causing a short-term slow-down in blood flow to the heart.

"We're not certain why, but seasonally, it's more common to have a heart attack in winter months than during summer months," says Stein. "It's true whether you live in Arizona or Minnesota."

According to AHA, employees with heart disease are at special risk. As people age, their ability to maintain a normal internal body temperature often decreases. Because older people seem to be relatively insensitive to moderately cold conditions, they can suffer hypothermia without knowing they're in danger.

People with coronary heart disease often suffer chest pain or discomfort called angina pectoris when they're in cold weather. Besides cold temperatures, high winds, snow and rain also can steal body heat, the AHA counsels. Wind is especially dangerous, because it removes the layer of heated air from around the body. At 30 Fahrenheit in a 20-mile-per-hour wind, the cooling effect is equal to calm air at 4 Fahrenheit. Similarly, dampness causes the body to lose heat faster than it would at the same temperature in drier conditions.

Stein suggests employees dress for the weather, wear a scarf or face mask to create a buffer zone between frigid air and the lungs, and refrain from undertaking more strenuous activities in the winter than they would do in the summer.

- Sandy Smith