

COLD STRESS IN **INDUSTRIAL ENVIRONMENTS**

COURSE OUTLINE

- **The first step to preventing cold stress is knowing what it is and how it affects your body.**
 - The exact conditions that lead to cold stress can be difficult to define because it can vary from region to region.
- **Workers who live in areas where winters aren't particularly cold can start developing symptoms of cold stress at much higher temperatures than workers who live in colder parts of the country.**
 - This is because their bodies are not “acclimated” to the cold.
- **So “cold stress” isn't defined by the outdoor temperature.**
 - It is defined by your internal or “core” temperature.
- **The average human body temperature is 98.6°F.**
 - If that number drops or your body struggles to maintain it, you are experiencing cold stress.
- **When you're in a cold environment, your body uses most of its energy to maintain a normal internal temperature.**
 - To do this, it will shift blood flow from extremities like your hands, feet, arms, and legs to your chest and abdomen.
- **Your body will also constrict blood vessels to minimize heat loss.**
 - This is a process called “vasoconstriction”.
- **When that isn't enough to keep your body warm, you will start to shiver.**
 - This is more than just a “surface” reaction to the cold.
 - It's actually another one of your body's attempts to keep you warm.
- **“Shivering” is the act of your muscles tightening and loosening repeatedly over a short period of time.**
 - This creates energy, which gives off heat.

- **Severe shivering happens when the body's temperature drops below 95°F.**
 - At this point you are in danger of developing hypothermia... which is when your low body temperature can affect your brain.
- **Any worker who is exposed to cold temperatures can develop cold-related conditions that can lead to cold stress.**
 - But there are some factors that increase the risk of developing these conditions.
- **These factors include...**
 - Working in wet or damp environments.
 - Not dressing warmly enough.
 - Having a pre-existing health condition such as hypertension, hypothyroidism, or diabetes.
 - Not getting enough rest.
- **A low “wind chill” temperature, the combined effect of low air temperature and high wind speed, can also increase workers’ risk of experiencing cold stress.**
- **For example, if the air temperature is 45°F, you might not think the cold is much of a threat.**
 - After all, 45°F isn’t even considered “freezing”.
 - But if the wind speed is 35mph, the wind chill temperature is 28°F, which is the actual effect of the cold on your exposed skin.
- **So you should never underestimate the effects of working in cold temperatures.**
 - Understanding how your body reacts to cold environments is crucial in keeping yourself safe in those conditions.
- **When most people think of the potential effects of cold weather on their health, they most likely think of the “common cold” or the flu.**
 - However, when you are exposed to cold environments on a regular and prolonged basis, you can develop conditions that are much more serious.
- **Many cold-related conditions can cause...**
 - Serious damage to your skin and joints.
 - Permanent scarring.
 - Skin cancer.
 - Death.

- **Some of the most common cold-related conditions include...**
 - Chilblains
 - Trench foot
 - Frostbite
 - Hypothermia.
- **Chilblains occur when the skin's blood vessels start to swell, leaving behind itchy and painful patches of skin. Other symptoms include...**
 - Redness.
 - Blistering.
 - Possible ulcers.
- **Chilblains are caused by the combination of cold weather and poor circulation.**
 - This means that your extremities, your nose, hands, feet and ears, are most at risk.
- **You can guard against chilblains by wearing warm clothing like gloves and thick socks, but make sure they aren't too tight.**
 - That will only restrict your blood flow and increase your chances of developing the condition.
- **Women and people who are underweight are at an increased risk of developing chilblains.**
 - But anyone who is exposed to the cold for a prolonged period can experience it.
- **Another cold-related condition that can affect your extremities is "trench foot".**
 - This is a blackening and eventual death of the surface tissue.
 - It often develops from working in an environment that is both cold and wet.
- **In fact, you can get trench foot in temperatures as high as 60°F if your feet are wet.**
 - This is because feet lose heat 25 times faster when they are wet than when they are dry.

- **When your feet lose heat that quickly, their blood vessels start to weaken, which is what leads to damage to the surrounding tissue.**
 - The first signs of trench foot are tingling and itching, which turns into numbness.
 - The feet can also turn bright red, but as trench foot progresses, they'll turn pale and clammy.
- **As time goes on, you might also experience...**
 - Swelling.
 - Leg cramps.
 - Blistering.
 - Bleeding under the skin.
 - Gangrene.
- **The more you ignore the signs of cold stress, the more severe your symptoms can become.**
 - In fact, your skin and tissues can actually freeze.
 - This condition is called frostbite.
- **Frostbite occurs when you're working in freezing temperatures, below 32°F, for a long period of time.**
 - Exposed skin is the most vulnerable to frostbite.
 - You can also develop frostbite on parts of your body that are covered by clothing or cold-weather gear.
- **Symptoms of frostbite include...**
 - Reddened skin that develops into white or gray patches.
 - Tingling.
 - Aching.
 - Numbness.
 - Blisters.
- **The symptoms you experience can also depend on the severity of frostbite you're experiencing.**
 - There are three "stages" of frostbite, and you can progress through them rapidly.
 - The first stage is called "frostnip".
 - At this point, your skin changes color and may feel cold, tingly and slightly painful.

- **When the water in the skin slowly freezes into ice crystals, you’ve reached the second stage.**
 - At this point you may feel a “pins and needles” sensation and your skin may sting or swell.
- **The third stage of frostbite occurs when the lower layers of your skin freeze and total numbness sets in.**
 - The affected area may turn black, and you could even have trouble moving it.
- **Left untreated, frostbite can cause permanent damage... and even lead to amputation.**
 - So it’s important to take action quickly if you feel that it’s developing.
- **Another type of severe cold-related condition is hypothermia.**
 - This life-threatening condition occurs when the body’s core temperature drops to less than 95°F.
- **This can happen when you are exposed to a cold environment for so long that your body starts to lose heat faster than it can produce it.**
 - At this point, your low body temperature will begin to affect your brain.
- **Hypothermia starts with uncontrollable shivering. As it progresses, you might also experience...**
 - Loss of coordination.
 - Confusion.
 - Slurred speech.
 - A low heart rate.
 - Slow breathing.
 - Eventually loss of consciousness.
- **As with frostbite, it’s important to take action as soon as you start to notice any signs of hypothermia.**
 - If your body temperature drops this low, you could lose your ability to understand what is happening to you or to even ask for help.
- **Knowing how to monitor yourself and coworkers for signs of cold stress is only “step one” of staying safe in cold environments.**
 - It’s also crucial to know what to do when anyone is experiencing symptoms of a cold-related condition.

- **To treat any cold-related condition, the first thing you want to do is get somewhere warm.**
 - The longer a body is exposed to low temperatures, the worse the condition will get.
- **What you do next will depend on what cold-related condition is developing.**
 - There are different emergency procedures for each type.
- **If you have chilblains, you'll notice redness, itching, and possible blistering.**
 - Do not scratch these areas!
 - Instead, slowly warm the skin.
- **You can also apply corticosteroid cream to relieve the skin's itching and swelling.**
 - If you develop blisters or ulcers, keep them clean and covered to avoid infection.
- **Chilblains should go away on their own in one to three weeks.**
 - If they don't, or they start to leak pus, talk to a doctor.
- **If your feet begin to go numb, swell, or blister from being in wet and cold conditions, you might have trench foot.**
 - In this case, you should call for medical assistance as soon as you can.
 - Left untreated, trench foot can lead to a serious infection.
- **As you wait for help, remove your wet shoes and socks, and gently dry your feet.**
 - Keep them elevated and avoid walking or standing on them, as this can cause tissue damage.
- **If you or a coworker develop frostbite, you need to act quickly.**
 - The recovery timeline depends on what stage it progresses to.
- **Stage one frostbite, also called "frostnip", can heal within a few days or weeks.**
 - But if it progresses to stage two, where the skin actually freezes into ice crystals, it can take up to six months to heal.
- **The third stage of frostbite is the most severe.**
 - It can cause permanent skin damage, even lead to amputation.
 - So if you notice any signs of frostbite on you or a coworker you need to act immediately, whatever stage it's in.

- **First, call for medical assistance and remove any wet clothing.**
 - Next, wrap a loose, dry cloth over the frostbitten area to protect it from contact.
 - Don't rub or massage the area.
 - This can cause tissue damage.
- **You shouldn't try to re-warm the frostbitten area yourself.**
 - If it is warmed and gets frozen again before medical help arrives, it will only cause more damage.
- **Another cold-related condition that requires an urgent response is hypothermia.**
 - When the body reaches an abnormally low temperature, it can begin to affect the brain.
- **So you need to call 911 the moment you notice that you or a coworker...**
 - Are uncontrollably shivering.
 - Seem confused.
 - Have slurred speech.
 - Loose coordination.
- **The key to treating hypothermia is restoring warmth to the body.**
 - The first thing you should do is to remove wet clothing and replace it with something dry and warm.
 - If possible, wrap the entire body in blankets or towels (don't forget the head and neck).
- **Another way to warm the body is by placing warm water bottles or "hot packs"...**
 - In the armpits.
 - On the sides of the chest.
 - In the groin.
- **Drinking warm, sweetened drinks can also help increase the body's temperature.**
 - This can cause a rise in blood sugar levels, increasing the body's insulin.
 - Which in turn, leads to more heat production.
- **However, if the 911 operator gives you different warming instructions, you should follow their directions.**

- **In some cases, a person suffering from hypothermia might lose consciousness.**
 - So check their pulse frequently, and if you can't find one, perform CPR until medical professionals arrive.
- **The best way to avoid cold stress is to stay out of cold environments.**
 - But working in cold conditions can sometimes be unavoidable, so you need to know how to keep yourself safe when you're in them.
- **For starters, you need to dress properly.**
 - You should wear three layers of loose-fitting clothing.
 - “Layering” provides insulation, and a loose fit allows for good blood circulation.
- **The type of fabric you wear for each layer matters, as well.**
 - Cotton loses insulation when it becomes wet, while wool, silk and synthetic materials retain it.
 - So they should make up the first two layers.
- **Your outer layer should also be made of a synthetic material, like nylon.**
 - This can protect you from rain and wind, while allowing for some ventilation, which will prevent you from overheating.
- **You should also wear a hat or hood to keep your head warm.**
 - Up to 40% of your body heat can be lost when you leave your head exposed.
- **If you're working around an area with falling debris, you might already be wearing a helmet or hard hat.**
 - In this case, wearing a hat under them could actually interfere with their fit and ability to protect you.
- **So you should wear a helmet or hard hat liner instead.**
 - This way, your head is protected from the cold and any flying objects.
- **To keep the rest of your body warm, you should wear...**
 - A knit mask, to protect your face and mouth.
 - Insulated gloves to keep your hands warm.
 - Insulated, waterproof boots to protect your feet.
- **Be sure to keep an extra set of dry clothes, gloves, socks and hats somewhere safe, in case the ones you're wearing get wet.**

- **There are three other things you can do during your workday to protect yourself and coworkers from cold stress.**
- **First, drink warm, sweetened beverages throughout your shift.**
 - They will help keep your body temperature up and your hands warm.
- **You should also take as many “warm-up” breaks as you need.**
 - Your employer will provide a warm area where you can recover from the cold.
- **Lastly, use a “buddy system” so that you and a coworker can monitor each other for signs of cold-related conditions.**
- **As for new workers, they should ease their way into working in a cold environment by gradually increasing the amount of time that they are in the cold.**
 - This “acclimatization” lets them build up a tolerance to the temperature that they are in.
- **You can’t control the temperature outside.**
 - However, there are things that you and your employer can do to make your environment safer when you’re working in the cold.
 - These are called “engineering controls”.
- **Radiant heaters, for instance, can warm outdoor workstations.**
 - They directly heat people and objects, rather than air.
 - They have limited reach, so they won’t warm up an entire work area.
 - However, they can be effective at warming individuals or single workstations.
- **You can also shield work areas with screens or vehicles to block out wind.**
 - Wind chill can significantly increase the risk of developing cold stress, so limiting its impact on workers is crucial.
- **Another way to protect yourself from cold-related conditions is by taking frequent warm-up breaks at “warming stations”.**
 - These can be mobile radiant heater stations that you and your employer set up, or a warm indoor location.

- **Another thing that you have to pay attention to when you are working in the cold is metal tools or machinery.**
 - You should avoid making direct contact with them.
- **Metal is a good conductor, which means it transfers heat energy quickly...**
 - So when your hand makes contact with a cold metal tool, it can “suck” the heat right out of your flesh.
- **You have to beware of ice on tools and equipment, too.**
 - Touching iced-up metal can cause an ice burn.
- **These burns can turn your hand red, white or gray.**
 - It might sting similarly to a sunburn, and the skin will feel firm or waxy.
- **Mild ice burns should be cleaned, soaked in warm water and covered with a sterile bandage.**
 - However, more serious ice burns require medical attention.
- **Wearing gloves can help you avoid these problems.**
 - Another solution is to wrap the handles of metal tools and machinery in insulating material so they don’t get as cold.
 - You can also use “de-icers” in these types of situations.

*** * * SUMMARY * * ***

- **The human body’s internal temperature should be about 98.6°F. When the body struggles to maintain this temperature due to being in cold or wet conditions, it can develop “cold stress”.**
- **Common cold-related conditions include chilblains, trench foot, frostbite and hypothermia.**
- **Remember to monitor yourself for symptoms of cold-related conditions throughout your workday. The sooner you’re treated, the less likely that it will lead to permanent tissue damage.**
- **The first thing you should do if you are developing a cold-related condition is to move to a warm environment. From there, treatment will depend on the type of condition you’re treating.**
- **When you’re in the cold, you should wear at least three layers of clothes, a hat or hat liner, and insulated gloves and boots.**
- **When you’re working in a cold environment, take frequent “warm up” breaks, drink warm beverages, and use the “buddy system” to monitor yourself and coworkers for symptoms of cold-related illnesses.**
- **Using engineering controls like radiant heaters, wind protection, insulating material, and de-icers can reduce the chances of developing cold-related conditions.**
- **Now that you know the conditions that you can develop working in the cold, how to treat them and ways to guard against them... you can keep yourself and your coworkers safe whenever you’re working in cold environments!**