Hello,

This issue of Safety Measures will feature articles written by students of the Fall 2009 OSHA Regulations class at Blue Ridge Community College, taught by EHSI’s own Chuck Arrowood.

Also in this issue, Dave “The New Guy” Martin discusses Arc Flash and the 2009 NFPA 70 E Standard.

We are planning to hold our EHSI Regional Safety Conferences this Spring. The western conference will be at Blue Ridge Community College in Flat Rock, NC on March 31. The eastern conference will be at Pitt Community College in Greenville, NC on April 7. More information will be sent as the date approaches. The conference is free and lunch will be provided, but we do ask that you register. As soon as you know you are attending, please contact us.

Watch For Hypothermia

“T’m freezing to death,” I said working outside one chilly morning. Little did I know that it was literally happening to me. Hypothermia is a serious condition where your core body temperature decreases to a level at which normal muscular and cerebral functions are impaired. When most people think of hypothermia, they think of summiting Mt. Everest or falling off of a fishing vessel in into the Bering Sea, when actually most hypothermia cases are triggered right in your home.

There are three stages of hypothermia, one being mild and three being the worst or “severe hypothermia.” Stage one hypothermia is a body core temperature that drops just 1.8 – 3.6 degrees F below normal body temperature (95-98.6 degrees F). Mild to strong shivering occurs which is just muscle twitches that are trying to warm you back up. Even in stage one the victim is unable to perform a complex task with the hands because they’re numb. Stage two hypothermia happens if your core body temperature drops by 3.8 – 7.6 degrees F below normal body temperature (91-94.8 degrees F). At this point shivering becomes more violent. Stage three the body core temperature drops below 89.6 degrees F which is immediately life threatening and the shivering usually stops. Difficulty in speaking, sluggish thinking, amnesia, not being able to use their hands and stumbling when they walk are all signs of this stage.

Hypothermia is so dangerous because it affects many vital organs throughout your body. Your brain, heart, lungs, and many more are coming to a halt. You lose your extremities first because your body wants to keep your vital organs alive longest. Frostbite may set in on your hands and toes which will lead to them having to be amputated. Now when you add water to the mix, you are really in trouble because cold water can make your body lose body heat up to twenty-five times faster than just being out in the cold air.

For all you outdoorsmen, if you notice these signs: shivering, confusion, memory loss, drowsiness, exhaustion, and slurred speech, it’s time to drop what you are doing and head indoors for a warm drink because hypothermia is setting in. If you can’t head inside you should add layers of dry clothing which will create more air pockets around your body to help warm you back up to temperature. You can try to increase your physical activity or get down and do some pushups; however, you don’t want to sweat. Sweat is water and water will freeze. Avoid alcohol, caffeine, and tobacco; you may think that they are helping to warm you up but they are not. You can always build a fire or body-to-body contact works every time.

By Matthew Todd, Blue Ridge Community College

Blue Ridge Community College

Volume 3, Issue 1
January 2010

A Little Different This Time

By Matthew Todd, Blue Ridge Community College

Blue Ridge Community College
Safe Winter Driving

According to the North Carolina Department of Transportation, driving on slippery roads is the biggest driving hazard. Remember the three rule (three car lengths between you and the car ahead of you); it will become very useful with stopping, slowing and turning corners. Allow the vehicle three times the stopping distance it would take on dry pavement and apply this to slowing down and turning. Pumping your brakes will be another big help with turning corners. Staying three car lengths behind will give enough stopping time. Use low gears on slick surfaces, over hills and around corners. Never tailgate, do not forget the three rule and test brakes frequently.

Visibility is a problem you may encounter this winter. Leave lights on in snow or rain. In fog use low beams; it will help you and oncoming traffic. If visibility becomes impossible or weather conditions worsen, pull off to the safest place. Put on your four-way flashers to warn other motorists. Wait until conditions change before driving. Clean off all windows, mirrors and headlights before resuming your trip. Do not take a chance with your life or the life of another motorist. If you find yourself stuck in the snow, avoid spinning the tires; spinning will only dig you deeper. Dig the snow away from tires and use sand and salt in the tires’ path. Kitty litter will also help with improving traction.

Sliding is a real possibility on icy roads. The NCDOT says, “bridges and overpasses are first to freeze and need to be approached with caution.” Do not brake while on a bridge. Even if after taking these precautions your vehicle starts skidding, do not panic. Hitting the brakes in a panic will cause your vehicle to lock up and skid. Relax, take foot off accelerator and turn the steering wheel in the direction of the slide. If you still cannot get control, try steering into a snow bank or fence away from other traffic. Do not risk a collision with another motorist if you can avoid it.

In case of an unfortunate event and you need to leave the warmth of your vehicle, dress warmly—cover your head, hands and body. Remember there is a blanket in your emergency kit if needing extra warmth. You may want to add hand and feet warmers to your kit; they will be an inexpensive investment to have in low temperatures.

Winter driving is only frightening if unprepared. Overall, keep your car in top shape, allow extra time when driving, listen to weather reports, keep the three rule in mind, and stock your emergency kit. Hey! Sometimes staying home and waiting the weather out might be the best strategy. Keep warm; drive safely and always buckle up!

The Highway Patrol Emergency Contact number is *HP (*47) from your cell phone.

Arc Flash and the 2009 NFPA 70 E Standard

An arc flash is the dangerous explosive release of energy caused by an electrical arc due to either a phase to ground or phase to phase fault. The arc flash is a voltage breakdown of the air resulting in an arc. The explosive energy release resulting from an arcing fault can consist of heat, pressure wave, vaporized metal (plasma) and molten metal. In addition to the explosive blast caused by the fault, there is also intense radiant heat produced by the arc. Even though arc flashes are normally of short duration (½ second or less), the energy released is tremendous and great destruction can occur.

Electrical arcs produce some of the highest temperatures known to occur on earth — approximately 35,000 degrees Fahrenheit (at 10 feet or more). This is four times greater than the surface of the sun. All known materials vaporize at this temperature. When any material vaporizes it expands in volume (water 1,670 times, copper 67,000 times). The air blast produced when materials vaporize can spread molten metal and other materials great distances. Rapidly expanding gases, molten metal and
Arc Flash and the 2009 NFPA 70 E Standard

metal plasma can produce extreme pressure and sound waves. Blast pressures waves can be 2,000 lb/FT2 (lung collapse can occur), and sound levels as high as 140dB at a distance of two feet from the arc blast can occur. Clothing can be ignited at a distance of several feet away and, depending on the clothing, burns can be severe when it continues to burn and melts to the skin.

The consensus standard for arc flash training and PPE is the NFPA 70 E standard (latest revision is the 2009 NFPA 70 E standard). NC OSHA under the revised electrical standard subpart S (August 13, 2007) has not adopted NFPA 70 E in its entirety, specifically PPE and clothing for arc flash protection. But the General Duty Clause, Section 5(a)(1) of the OSH Act could be cited referencing NFPA 70 E if there is no OSHA standard which addresses the specific violation. NC OSHA standard 29 CFR 1910.132 requires employers to conduct a hazard assessment and provide necessary PPE for employees. Also 1910.333-.335 addresses safety related work practices including PPE. NFPA 70 E discusses PPE and other protective equipment for employees working in a flash protecting boundary. Fire resistant (FR) clothing is required to comply with NFPA 70 E. NC OSHA recommends that employers consult consensus standards such as NFPA 70 E to identify safety measures that can be used to comply with or supplement the requirements of OSHA’s standards for protecting against arc flash hazards.

The 2009 NFPA 70 E standard has changes from the 2004 standard that affect labels on equipment, arc flash hazard analyses, required PPE, calculation of the protection boundary and training requirements. The biggest changes made are the arc flash analyses and the PPE required. The arc flash analyses would need to be done by someone competent to do the analyses. The incident energy that could be released would be listed on the equipment label in calories/centimeter squared (cal/cm2). Also based on the incident energy the level of PPE would be listed on the label. The required PPE is vastly different depending on the incident energy and the type of work being performed. As an example let’s look at a 460 volt, 30-60 amp disconnect or breaker that you need to work on with the circuit disconnected. After disconnecting and performing LOTO, verification that the circuit is disconnected must be done using testing equipment (VOM) and dressed in Hazard Risk Category 2* (CAT 2*) clothing and PPE. The 2009 NFPA 70 E standard requires CAT 2* clothing and PPE to consist of the following:

- FR long sleeved shirt and long pants (FR 8 cal/cm² min) Standard blue jeans are now only approved if they are at the proper FR
- FR hood or FR balaclava (balaclava covers head, neck, face and ears cut out for the eyes and nose) The * in the category listings allows a balaclava in place of a double layered flash suit hood with face plate that covers the face, head and shoulders all around
- FR face shield connected to a hard hat over the hood
- Safety glasses or goggles
- Hearing protection (ear canal inserts)
- Leather work shoes
- Leather gloves must be worn and can be worn with other gloves appropriate to the electrical hazard
- Underwear must be 100% cotton (no 99% cotton, 1% polyester)

The 2009 NFPA 70 E standard was released on September 5, 2009 so it hasn’t been incorporated into any State or the Federal Standards yet. Virginia and a few other States have incorporated the 2004 standard so the 2009 standard will be reviewed by many States and Federal OSHA shortly. Also since arc flash is now considered a “recognized hazard” by OSHA, the consensus standard NFPA 70 E can be evidence that the employer acted reasonably.

Body Mechanics for Daily Life

Injuries to the spine and back are a common and serious problem both in the workplace and in daily activities. According to OSHA, 600 thousand people each year are afflicted with some sort of back injury. These types of injuries account for the largest percentage of injuries in the workplace. Although back injuries are sometimes unavoidable, the severity and occurrence can be drastically reduced with the use of proper body mechanics when lifting, pushing, pulling, sitting, walking, and even lying down.

The goal of body mechanics is to maintain proper posture through what is called a “neutral spine.” A neutral spine refers to the natural state of the spine, with all three curvatures of the spine present and aligned. Your chin should be slightly forward with shoulders slightly back and level. By visualizing a proper posture and maintaining
Body Mechanics for Daily Life  (continued from page 3)

ing it, one can keep the spine in a neutral and safe position throughout nearly any activity.

The first step to maintaining proper body mechanics to reduce the occurrence of back injury is to minimize the amount of bending and twisting you do. When bending and twisting, pressure is put on the ligaments, muscles, and discs of the back and can easily lead to injury. If you need to bend, remember to bend at the knees and maintain proper posture in the back. Twisting should be done slowly and should not be stretched past a comfortable level. With the proper spine position and bending techniques mastered, you can prepare to move as you need.

If the task at hand involves lifting, you should check the weight of the item you are going to lift. This does not necessarily mean a physical weight, but more of an analysis to determine if you can handle lifting the item. You want to make sure you face the object you intend to lift, and hold it as close to your body as possible. Keeping a wide stance will give you a good base of support. If you must turn, pivot on your axis instead of twisting as twisting can cause a back injury. When setting the object down, remember to squat and lower the item instead of bending at the back and lowering the item. Remember to push any objects, do not pull them. There are too many different ways to incorporate body mechanics into daily activities to list, but it is important remember to maintain your correct posture and think about the best way to move before you move. If you suffer from back pain already or simply want to safeguard even further against back injuries, you should practice strengthening and stretching of the spine. People that exercise their backs regularly suffer far less back injuries. If you are in a position that promotes a forward curve, such as sitting in a chair all day, it may be helpful to stretch the spine in the direction opposite of the unnatural curve. This will allow the spine to loosen and regain the strength to maintain its natural curve. If you suffer from back pain at night, you should use a firm mattress and a pillow under the knees to give your back the best support.

There are many ways to reduce or eliminate back injuries in the workplace. The most important thing to remember is to set your posture evenly. Then combine your posture with the forethought to plan how you are going to move according to the demands of each individual situation. Remember to exercise regularly and to thoroughly stretch your back to keep everything loose and flexible. Maintaining proper body mechanics will greatly reduce the chances of suffering from a back injury on the job or while going about your daily activities.