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ROUX Health & Safety News

Understanding Inhalation Hazards and How to Protect Yourself

By Patrick Rubenbauer – New York

Every day workers are potentially exposed to common and sometimes unusual inhalation hazards. At Roux, typical job sites present airborne dust and carbon monoxide hazards, which can be monitored and controlled efficiently. However, certain projects can pose unique threats such as airborne PCB dust particulates, silica dust, asbestos, mercury vapors, and various volatile organic compounds (VOCs). It is essential to understand both the dangers presented by these hazards and the steps you can take to protect yourself.

Dangers of Inhalation

Silica dust can be a common airborne contaminant if not properly controlled at the source. Typically, airborne silica is present due to cutting, grinding, drilling, or disturbing materials which contain crystalline silica such as concrete. Silicosis is a common disease associated with silica dust inhalation, and as a result causes the build-up of scar tissue in the lungs from acute or chronic exposure to dust containing silica. Silicosis can cause bronchitis-like symptoms, difficulty breathing, chronic phlegm production, and attribute to the development of cardiovascular diseases.

Another dust inhalation related condition, asbestosis, is a chronic lung disease caused by long-term inhalation of asbestos fibers, typically the result of construction/demolition activities. Symptoms of asbestosis are similar to silicosis, but long-term inhalation of asbestos can lead to mesothelioma, an aggressive cancer that affects the lining of the lungs.

We commonly deal with VOC contamination at sites, often VOCs associated with petroleum hydrocarbons. Acute VOC inhalation can cause shortness of breath, dizziness, fatigue, and nose/lung irritation. Long-term exposure or exposure to high concentrations can lead to various cancers of the liver and kidneys, and can cause damage to the central nervous system.

How to Protect Yourself

Luckily, there are plentiful methods and options to protect yourself from inhalation hazards.

- Dust Prevention – Use wet methods during dust-generating work activities. Water the site, if necessary, to prevent airborne dust from becoming an issue in the first place.
- Air Monitoring – Use properly calibrated equipment (e.g. dust meter, photoionization meter, multi-gas meter) to monitor your work environment for dust, VOCs, and other possibly harmful gases/vapors.
- Air Filtration/Purification – Air purification systems can be set up in your work environment to filter out certain compounds, such as dust and other construction debris. Filtration systems with appropriate filters can also reduce potential VOCs in air, as appropriate.
- Respirator/Self Contained Breathing Apparatus (SCBA) – Respirators and SCBAs can be used in order to prevent inhalation; however, airborne contaminants should be known. This is to ensure proper selection of cartridges and changeout schedules for filters in the case of air-purifying respirators.

Remember, PPE is a workers' last line of defense, it is preferred proper engineering and administrative controls be instituted prior to PPE implementation. Respiratory protection should be instituted when airborne hazards cannot be removed from the work environment. Depending on the nature and severity of the hazard, half-face and full-face respirators are commonly used to defend against airborne contaminants. In particularly hazardous environments such as those immediately dangerous to life and health or when contaminants are unknown, SCBAs are required as they supply a fresh source of breathable oxygen, instead of just filtering out contaminants from the work atmosphere. As always, you should consult with someone within your organization who has proper PPE/respiration knowledge in order to identify the correct respirator to protect yourself in your unique environment. Remember, those who are required to wear respiratory protection need to be medically cleared, fit tested, and properly trained prior to using respiratory protection.

The most important part of inhalation safety is to always be mindful of the work taking place around you and the different hazards that can be created. Stay vigilant, don't get complacent, and be aware of the serious long-term complications associated with potential inhalation exposures.

Safety Tips for Wetland Delineations

By Kristy Northrup – Logan Township, New Jersey

Wetlands Overview

As a subset of our Brownfields Practice Area, some of our clients come to us when they suspect that wetlands might be on their property. Typically, our clients are trying to redevelop the land and they need to know if and where wetlands might be located before they start to build. We are also utilized internally for remediation projects where wetlands were identified during the receptor evaluation. Whether you have impacted wetlands on or adjacent to your site could influence your remedial investigation (and potential ecological assessment). It is therefore critical to have confidence in the exact location of your wetland boundaries. While publicly available maps give us an initial idea of where wetlands might exist, nothing beats the "boots on the ground" approach to flagging the wetlands in situ.

Wetland delineations are conducted by specialists usually trained in biology and/or soil science. Depending on the location of the site, wetland scientists follow one of two main procedures for delineating wetlands. Both methods use a three criteria approach, where the wetland scientist must evaluate the plants, soil, and hydrology to characterize the land as being either a wetland or an upland.

Common Wetland Hazards

When we are sent to a site to conduct a wetland delineation, the environmental quality of the site may be poor due to existing site development and potential contamination. This can pose a risk to the wetland scientist who needs to collect soil borings for evaluation. At select locations throughout the site, an open-faced auger is used to extract a soil core and then texture is assessed by feel. In accordance with the job loss analysis (JLA) form, the most appropriate personal protective equipment (PPE) should be worn at all times to minimize skin contact with potential contaminants in the soil. If the delineator needs to wade through shallow water, muck boots or waders are also required to prevent contact with the water.

More often than not, the wetland scientist must traipse through wooded areas with tree roots, branches, low lying shrubbery, thorns, and other tripping hazards. Cut-resistant gloves are recommended for moving branches out of the walkway, but sometimes the best solution is to pick a different path through the woods. Inspecting the ground first before stepping one way or another can make all the difference in arriving at your destination safely. Additionally, ponded water can make for a muddy and slippery mess. It is imperative to take slow, deliberate steps and to avoid carrying more equipment than necessary. Field supplies should be stored in a backpack while walking around the site; this will keep items from catching on branches or vines and will keep hands free for balance and support.

Thick vegetation also brings the risk of branches scratching or poking the field delineator in the eyes, so safety glasses must always be worn. If you can picture yourself in the middle of the woods for a delineation, do you think you have all your PPE? Gloves? Boots? Backpack for supplies? Safety glasses? You're off to a great start, but you may still need a few more things...

Biological and Weather-Related Hazards

Obviously, wetland delineations require us to be out in the field. Whether it's at a peat bog or a salt marsh, the promise of a seasonally high water table means bugs galore. Insect repellent that contains DEET should be applied every few hours, and if there are known or suspected ticks at the site, it would be wise to treat your clothes with permethrin the day before your site visit. Regardless of how often or what kind of repellent is used, tick checks should be conducted thoroughly during the field event, especially before getting back into your vehicle, and once again when you get home.

Unfortunately, the plants in your wetland can be a biological hazard as well. Poison ivy is a facultative species in many regions of the United States. That means that it can grow and thrive in both wetland and upland conditions. Wetland scientist should be familiar with poison ivy (three almond-shaped leaves that range in color) and take precautions to avoid contact with the plant's oils. One easy trick is to wear long sleeves, even in the middle of the summer, or pack a Tyvek in your car just in case.

Last but not least, weather conditions should be kept in mind for scheduling wetland delineations. As with all other sites, thunder and lightning can put a damper on the field work progress. Many wetland delineations take place in the middle of a forest and it can be challenging to reach a safe place quickly. Furthermore, these events require the use of a hand auger to advance soil borings. The last thing you want to do is find yourself in the middle of a wetland with a metal auger in one hand when lightning strikes. Plan accordingly to avoid stormy field days.

In terms of temperature, it is common for our wetland delineations to occur during the hot summer months. Wetland delineators should come prepared with plenty of water to drink (potentially in a backpack water bladder) and should take frequent breaks to avoid heat exhaustion and overexertion. Remember that if you're the only person at a site, you cannot rely on someone else to call for help. Instead, rest when necessary to maintain a healthy pace.

Dermal Exposure in the Workplace: How to Protect Yourself

By Lauren Mitchell – Oakland, California

When I was 15, I worked at a busy childcare center. At the end of the evening, after the last child was picked up by their parents, the staff would get to cleaning. One night, while diluting a concentrated cleaning solution, I spilled a bit onto my hand. I washed it off quickly, thinking nothing of it. However, a week later I found myself combing the internet to identify what was happening to my skin. I didn't even make the connection that it was from the chemical exposure at work. My lack of knowledge about the chemicals we used and a lack of training on how to protect myself contributed to an easily avoidable workplace dermal exposure injury.

Unfortunately, these types of injuries are common: 3.4 skin-related injuries are reported to the Bureau of Labor per every 10,000 employees yearly, compared to 1.9 respiratory illnesses per 10,000 employees. Occupational skin diseases (OSD) are the second most common type of occupational diseases. OSDs include irritant contact dermatitis, allergic contact dermatitis, skin infections, skin injuries, skin cancers, and other skin diseases.

Skin Hazards

OSDs can be caused by chemical, physical, and biological agents, and by mechanical trauma. Chemical agents are the most common and can be divided into two subcategories: sensitizers and primary irritants. Repeated exposure from sensitizers can cause an allergic reaction, while primary irritants cause a direct chemical reaction with the skin.

Physical agents include extreme temperature conditions or radiation exposure. Biological agents include plants, animals, and microorganisms. Parasites, insect bites, and poison oak and ivy are considered biological agents of OSD. Mechanical trauma can occur through abrasions, cuts, and lacerations, and even pressure or friction. Cut-resistant gloves are necessary for many tasks on the worksite and help prevent mechanical trauma.

Chemical Absorption

Chemicals can migrate from the surface of the skin into the body without entering through a break in the skin. This process is called dermal absorption and it is controlled by diffusion. When a chemical is present on the outer layer of skin, it creates a concentration gradient between the outer and inner layer, which initiates mass transfer across the cell membranes. In this way, the concentration of the chemical that comes in contact with skin is the key factor in determining the rate of absorption.

In my case, the concentrated cleaning product created a dramatic concentration gradient when it met my skin, allowing for rapid diffusion. In many cases, skin absorption has been the primary source of internalized doses of polycyclic aromatic hydrocarbons (PAHs). Mercury and polychlorinated biphenyls (PCBs) can also be readily absorbed, and precautions should be taken when working with these chemicals.

Recognizing Contact Dermatitis

Contact dermatitis constitutes 90-95% of all OSD in the United States, therefore it is important to understand the signs and symptoms. It is defined as inflammation of the skin resulting from contact with a hazardous agent. Symptoms include swelling, itchiness, dry skin that may develop cracks, pain, redness, and the development of small blisters with a white center. Contact dermatitis can be triggered by an irritant source or by an allergic reaction that was triggered by dermal contact. At-home treatments include moisturizing, applying a cool wet compress, and taking an antihistamine such as Benadryl to help reduce itching. If home treatments do not ease symptoms, doctors can prescribe steroid creams and oral medications.

Protective Measures

To avoid dermal chemical exposure, employ these protective measures on the job:

- Have an OSHA-required safety data sheet (SDS) for each known chemical you may be working with on the jobsite. These include information about risks for skin irritation, cancer, and allergies.
- Always wear appropriate PPE, which may include gloves, aprons, hats, or masks. Nitrile gloves are useful in protecting against chemicals and infectious agents. Nitrile gloves should be layered under cut-resistant gloves.
- Do not eat, drink, or smoke in your work area. This can introduce additional pathways for chemicals to enter the body.
- Another skin-harming force is the sun. Always protect your skin with a high SPF sunscreen and light layers.
- Don't bring contamination home with you. Dispose of used nitrile gloves into a trash bag separate from field supplies and properly clean your boots, clothes, and backpack.
- Shower and wash hands thoroughly after being in the field and protect your hands with petroleum jelly, lotion, or cream.
- Communicate with your office Health and Safety Manager if you notice any skin irritation or changes in skin condition.

Drilling Safety By Dan Heilemann – Logan Township, New Jersey

Drilling activities account for some of the most hazardous tasks we oversee at Roux. Being in close proximity to large machinery with moving components requires spatial awareness and alertness in order to minimize potential losses. For Roux, it starts with preplanning work activities and requirements which aid in mitigating potential hazards in the field. This can include, but is not limited to, public/private utility mark outs; establishment of preclearing requirements/protocol; development of heavy equipment exclusion zones, as well as outlining specific personal protective equipment (PPE) which can vary depending on the work environment; contaminants of concern; and more. Additionally, various drilling methods can pose equipment-specific hazards which need to be considered when developing the overall scope of work and development of an equipment-specific job hazard analysis. Proper pre-planning allows for both Roux and its contractors to be aligned when it comes to implementing an effective health and safety plan.

Pre-drilling Safety

While physical hazards (i.e. line of fire, rotating augers) associated with drill rigs may seem like the most dangerous aspects during drilling, the first few feet of your drill hole can pose a significant risk from both a personal injury as well as to potential infrastructure. Taking the initial steps to preclear a proposed drilling location will go a long way in preventing potential contact with subsurface utilities.

The process of preclearing the proposed drill location serves as a precaution to potential hazards that may arise from the physical subsurface. This provides visual confirmation of the subsurface through the use of hand tools (e.g. hand auger), a pressurized air knife, or vacuum. These tools are much less aggressive than a drill rig boring through the ground, allowing for careful visual inspections of the subsurface.

Preclearing prior to drilling can help identify utility lines that were missed by public mark outs or private geophysical investigations. This greatly reduces the risk of damaging gas, water, electric, or fiberoptic utilities.

While not included in a public/private utility mark out, identifying overhead utilities is still necessary prior to subsurface drilling activities to ensure the drill rig has a sufficient and safe amount of space to drill.

While preclearing your drill location, always make sure to wear appropriate PPE outlined within a job hazard analysis. As mentioned above, understanding what exists in the first few feet of the subsurface and the utilities that may reside in this zone prior to drilling, is essential to mitigating potential hazards such as utility strikes.

Drill Rig Hazards

There are various types of drill rigs, all of which can pose significant physical hazards. Common hazards that are consistent amongst all types of drill rigs are: pinch points, pressurized hydraulic lines, and overhead booms under stress. The material (e.g., soil) being drilled into is also a common hazard, notably if the material is contaminated. Regardless of size/power generated by the drill rig, it is always important to work to eliminate potential contact hazards by keeping a safe distance away from equipment and any moving pieces. For all drill rigs, it is important to properly inspect the equipment prior to beginning work—especially inspecting all emergency stop buttons. If any part of the equipment is not functioning properly, work should not begin until the equipment has been repaired appropriately.

In addition to these shared hazards, there are drill rig-specific hazards, which may vary depending on the rig and type of drilling method (e.g., direct push, air/mud rotary, sonic, hollow stem). A common misconception is that the larger the machinery, the more dangerous it will be. However, a smaller rig like a direct push Geoprobe can still be just as dangerous as a larger truck-mounted air rotary rig. Larger equipment used by subcontractors, like truck-mounted sonic drill rigs, are among the safest of the drilling methods Roux personnel encounter due to minimal physical contact with drilling equipment and the encapsulation of drilling materials within the drill rod. *(Cont. on Page 5)*

Drilling Safety (Continued

By Dan Heilemann – Logan Township, New Jersey

Nevertheless, it is still important to be mindful of potential hazards. Below are some of the method-specific hazards for each drilling type.

Sonic Drilling

Sonic drill rigs use sonic vibrations and differing frequencies to penetrate the subsurface. The drilling is performed by going through the center of a steel casing that is attached to the rig. This keeps all the drilling material encapsulated within the system, preventing material from spraying out from the drill hole. While sonic drilling is a large piece of equipment that requires proper exclusion zones, the hazards associated with drilling activities are generally safer than comparable drilling methods.

Air Rotary Drilling

A truck-mounted air rotary uses compressed air to help the drill bit advance downward. In order to keep the borehole clean and accessible for the drill bit, compressed air is periodically blown down the hole by the operator to clear out unnecessary debris. This means dirt, dust, mud, or water can be expelled from the drill hole at high pressures, leading to airborne debris. Depending on the consistency of the debris and proximity to the borehole, additional engineering controls or PPE, such as dusk masks or Tyvek suits may be required.

Mud Rotary Drilling

Similar PPE from that of air rotary drilling may also be required for truck-mounted mud rotary rigs, which circulates drilling fluid down the borehole and back into a slurry tank next to the rig. Mud slurry collected from downhole may splash as it is being brought up from the borehole, which is why it is important to always remain a safe distance from the borehole, away from the drillers operating the machinery.

Hollow Stem Auger Drilling

Hollow stem auger drilling uses either a track-mounted Geoprobe® or a slightly larger truck mounted auger and boom. This is typically the smallest of the drilling rigs Roux personnel encounter, but this also means it is the most “hands on” rig used by subcontractors. Since the drilling equipment is so small, it requires subcontractors to manually and physically move auger heads constantly on and off the rigs in order to drill downhole. Due to this direct interaction with the equipment, pinch points and drilling contaminants are of particular concern with this drilling technique.

Exclusion Zones

Best practices advise that exclusion zones should be set at greater than the swing/tip radius of the specific heavy equipment. This is to keep unnecessary personnel outside of the work zone from wandering too close to the drill rig and to provide a safe distance from the drill rig in case failure occurs. Roux's standard practice is to set an exclusion zone at least 15 feet around the drill rig or greater than the swing/tip/reach radius of any moving part on heavy equipment. This is done in order to eliminate the potential for line of fire, contact, and other unique hazards which heavy equipment may pose. Use of effective barriers will aid in preventing unauthorized personnel from getting too close to the operating machinery. Additionally, no one, including authorized operators, should be within 3 feet of the operating equipment (e.g. rotating augers) as pressurized drilling rods and hydraulics could cause bodily harm while in use. Exclusion zones serve as a barrier between outside forces and the work being performed at hand to minimize the potential for a significant loss.