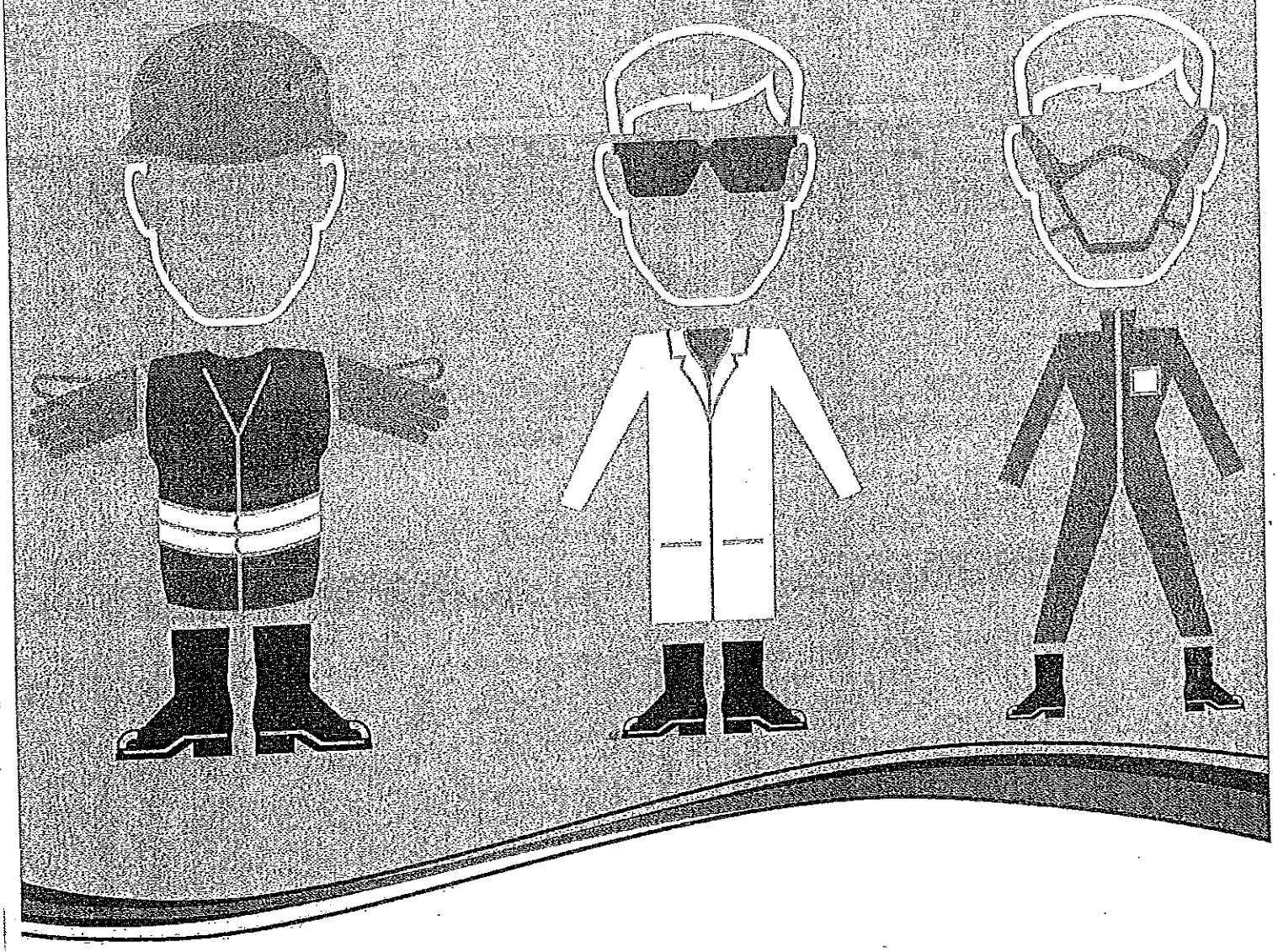
2016 Let's Talk Safety

52 Talks on Common Utility Safety Practices for Water Professionals



American Water Works Association

Let's Talk Safety 2016: 52 Talks on Common Utility Safety Practices for Water Professionals

Printed in the United States of America.

Project Manager: Gay Porter De Nileon
AWWA Staff Engineer: Jennifer Santini
Cover Art and Production: Cheryl Armstrong

ISBN 978-1-62576-133-0
eISBN 978-1-61300-360-2

American Water Works Association

6666 West Quincy Avenue
Denver, CO 80235-3098
303-794-7711
www.awwa.org

Contents

How to Use *Safety Talks* 1
Acronyms and Abbreviations 5

Week	Talk	Page
1.	Accident Investigation: Key to Preventing Future Accidents	7
2.	Avoiding Slips and Trips*	11
3.	Avoiding Arc Flash	15
4.	Don't Get in a Bind with a Backhoe	17
5.	Be Kind to Your Body: Stretch Before Working*	21
6.	Be Prepared for an Emergency	23
7.	Biohazards and Worker Safety	25
8.	Carbon Monoxide: A Silent Killer	27
9.	Identify, Treat, and Prevent Carpal Tunnel Syndrome	31
10.	Don't Let Chemicals Get You!	33
11.	Keeping Chemical Deliveries Safe*	35
12.	Climbing Elevated Tanks—The Height of Safety	37
13.	The Safe Use of Compressed Air	41
14.	Climb into Confined-Space Safety	43
15.	Build In Construction Site Safety	47
16.	CPR and AEDs Can Save Lives	49
17.	Cutting Pipe Safely with Power Saws*	53
18.	Message to Self: Distracted Driving Is Dangerous	57
19.	Energized Electric Equipment Can Be Deadly	59
20.	Don't Be Shocked by Charged Pipes!*	63

21. Eyes on Safety 65
22. Working at Altitude: Don't Fall into Danger 67
23. Safe Fuel Handling Practices 71
24. An Open and Shut Case for Gate Valve Safety 73
25. Holding on to Hand Safety 75
26. Listen Up to Protect Your Hearing* 77
27. Don't Get Bit or Stung! 79
28. Jackhammer Safety 83
29. Job Hazard Analysis: Identify and Reduce Hazards* 85
30. Know What's Below: Call 811 Before You Dig! 89
31. Avoid Harm from Laboratory Hazards 91
32. Climb on to Ladder Safety 93
33. Take a Load Off: Tips for Safe Lifting 95
34. Lightning: The Underrated Killer 97
35. Lockout/Tagout: Water Under Pressure Poses Danger* 99
36. Keep Trouble Out and Let Help in with Access Control 101
37. Night Work: Reduced Visibility Increases Hazards 105
38. Hurricane Preparedness* 107
39. Facing up to Stress 109
40. How to Conduct a Safety Tailboard 111
41. Quick Equipment Checks 113
42. Safety Tips for Employees Working Remotely or Alone 115
43. Setting Up a Safe Traffic Control Zone* 119
44. Temperature Extremes: Hypothermia and Heat Exhaustion 121
45. Trenching: Don't Dig Into Trouble! 125
46. Vehicle Safety: Check, Inspect, Drive! 127
47. Weld Well to End Well* 129
48. Reducing the Risk of Workplace Violence 131
49. Powerful Protection from PPE* 133
50. Handling the Load: Forklift Safety 135
51. Understanding Safety Data Sheets 137
52. Texting and Working Don't Mix 139

Other AWWA Safety Products 141

*These talks feature companion video clips on *Let's Talk Safety 2016: Dual Disc Set* (Product No. 10125-16)

How to Use *Safety Talks*

The American Water Works Association is pleased to provide you with this 2016 edition of *Let's Talk Safety.* AWWA Health, Safety, and Environment Committee members have reviewed and suggested updates to the discussion topics to ensure they continue to be current, pertinent, and beneficial to you and your employees.

Website addresses at the end of nearly every article allow you and your staff to conduct deeper research into particular safety topics. Because AWWA members and *Let's Talk Safety* subscribers have asked that many articles be updated and repeated every year, these users can be assured that these essential articles comprise this edition. Many safety topics remain extremely important and warrant regular discussions.

Several of the talks are new or have been substantially rewritten. New talks include Avoiding Arc Flash (week 3); Don't Be Shocked by Charged Pipes! (week 20); Working at Altitude: Don't Fall into Danger (week 22); Avoid Harm from Laboratory Hazards (week 31); Keep Trouble Out and Let Help in with Access Control (week 36); Hurricane Preparedness (week 38); Texting and Working Don't Mix (Week 52). Talks that were substantially rewritten include Don't Get Bit or Stung! (week 27); Holding on to Hand Safety (week 25); and CPR and AEDs Can Save Lives (week 16).

AWWA's companion product set, *Let's Talk Safety 2016 Dual Disc Set* (No. 10125-16), includes a PDF of the full book on CD, which allows easy printing of selected pages, and a DVD containing 12 video clips—each corresponding to a specific talk in the book. The talks referenced by an asterisk (*) in the table of contents have companion video clips on this product. Refer to the back pages of this book for a selection of books, standards, and manuals, as well as a listing of AWWA's extensive Safety First and other safety DVDs, that can augment safety awareness training. All of these products are available at www.awwa.org/store.

We are all seeking an injury-free work environment. Our universal goal is to have every employee, every day, return home to his or her family uninjured. We believe that the first step to not being injured is knowing that you can be injured. *Let's Talk Safety* is designed to help you build awareness of potential work hazards and provide safety practices that help mitigate those hazards. Talking to your employees about their safety and listening to their

safety concerns and experiences are the foundation to building an effective safety culture. This book will help you open up important safety dialogues and give you common starting points for discussion. You may also want to consider placing these articles in your employee safety publications.

Here's how to make your safety meetings more engaging and effective:

- Cover only one safety topic in a meeting. Employees can easily lose focus when too many topics are discussed.
- Ensure the discussion topic is pertinent to the participants. AWWA *Let's Talk Safety* covers topics in a generic manner, and a particular talk may not apply to every workplace and every work situation. Be creative and use a topic presented here and relate it to your work group's particular safety issue or concern.
- Provide examples. Citing real accidents that are in the news or something that occurred at another facility (or your own) can provide a reality check for the topic and take it out of the realm of "It'll never happen to me."
- Involve the employees in the meeting. You may want to appoint a different employee each week to lead the discussion. Ask questions and ask for personal examples of near misses and hazardous situations.
- Don't let a safety meeting become a complaint session—especially if it's not about safety! Acknowledge the complaint, and let the workers know it will be addressed afterward. Keep the focus on the safety topic at hand.
- Chalkboards, charts, DVDs, and other interactive materials will all help keep the topics engaging. Change up the meetings occasionally by bringing in the tools or personal protective equipment being discussed. When talking about large equipment, hold the meeting in the yard and use the specific equipment as the backdrop.
- Occasionally invite guest speakers who are experts in a particular subject.
- Conduct your meetings early in the week so the employees have a chance to practice what they hear.
- Avoid embarrassing a particular employee by pointing out that person as an example of what not to do. Speak in generalities if possible.
- Pass out copies of the *Let's Talk Safety* briefing each week.

The safety awareness information presented in this book is designed to help your utility workers develop a greater safety awareness of potential job hazards and help them make informed, mitigating decisions. The information contained in *Let's Talk Safety* provides only general safety awareness guidelines related to the many aspects of working in the water utility industry. This compendium is not comprehensive and does not cover every potential aspect of a safety issue a typical water utility worker may encounter.

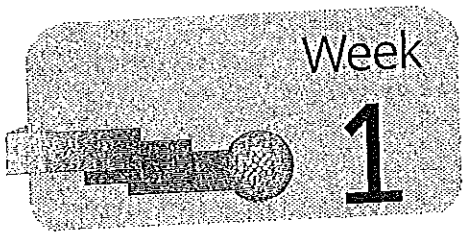
The safety articles are not intended, nor should they be considered, as a substitute for more comprehensive and formal safety training courses and certification programs that provide greater detail and explanation.

For employees to do their jobs effectively and safely, they must be responsible for learning and understanding the safety rules and regulations that apply to their particular occupation. Health and safety regulations and requirements mandated by federal, state or provincial, and local governments, as well as by your company's established policies and regulations, need to be consulted before any work begins.

Acronyms and Abbreviations

AED	automated external defibrillator
AHA	American Heart Association
AWWA	American Water Works Association
CDC	Centers for Disease Control and Prevention
CO	carbon monoxide
CPR	cardio-pulmonary resuscitation
CTS	carpal tunnel syndrome
dB	decibels
EMS	emergency medical service
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
HCS	Hazard Communication Standard
HIV	human immunodeficiency virus
JHA	job hazard analysis
LEL	lower explosive limit
LFL	lower flammable limit
MSDS	Material Safety Data Sheet (now SDS)
NHTSA	National Highway Traffic Safety Administration
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health, a division of CDC
NRR	noise reduction rating

NSC	National Safety Council
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
POC	point of contact
PPE	personal protective equipment
ROPS	rollover protective structure
SCA	sudden cardiac arrest
SDS	Safety Data Sheet
TLV	threshold limit value
USEPA	US Environmental Protection Agency
WARN	Water/Wastewater Agency Response Network



Accident Investigation:
Key to Preventing Future Accidents

Your safety program is in place, your employees have been trained, and still, accidents will happen at work. When they do, they need to be investigated, and this should be considered a vital part of your safety program. Why should accidents be investigated?

- To identify the causes of the accident
- To recommend corrective actions
- To prevent the accident from occurring again

An accident should always be investigated if it results in one or more of the following:

- Fatality or fatalities
- Serious injury
- Property damage
- Near miss of any of the above

An accident investigation should be handled by the supervisor(s) involved, a safety manager or inspector if there is one on staff, and/or a safety committee consisting of various employees. Anyone involved in an accident investigation should have appropriate training from a certified safety professional. The investigation should have the following components:

Planning

- Accident reporting policy in place
- Investigation training
- Development of report forms

Fact Finding

- At the scene
- Time of day, location, and type of work being done

- Safety protection devices provided; were they being used?
- Actions that caused the accident
- Preservation of evidence
- Interviewing of witnesses (Who? What? Where? When? Why? How?)
- Collection of evidence, including photographs

Analyses

- Review of data
- Distinguishing facts from opinions

Conclusions

- Each identified contributing factor should be addressed

Recommendations

- One for each conclusion
- List of corrective actions
- Follow up

Implementation of Corrective Actions

The form on the next page will help you in your accident investigation. Make sure that al employees are aware of the program. Ask employees, when they are on a jobsite, to be aw of their surroundings and the actions taking place. Their awareness could help in an acci- dent investigation and maybe even prevent the accident from happening in the first place

For more information read AWWA Manual of Practice M3, *Safety Management for Utilitie* seventh edition.

Accident Investigation Form

Date/Time: _____ Person(s) injured: _____

Describe injury: _____

Describe property damage: _____

Describe activities or job being performed: _____

Cause Factors

Y N **PROCEDURES**
- ☐ ☐ Are procedures established?
- ☐ ☐ Are procedures written?
- ☐ ☐ Was employee familiar with procedure?
- ☐ ☐ Was supervisor familiar with procedure?
- ☐ ☐ Were procedures followed?

Y N **EQUIPMENT and TOOLS**
- ☐ ☐ Was the proper equipment used?
- ☐ ☐ Was the proper equipment available?
- ☐ ☐ Was the proper equipment on site?
- ☐ ☐ Was the equipment properly maintained?
- ☐ ☐ Was the employee trained to operate the equipment?
- ☐ ☐ Were the proper tools used?
- ☐ ☐ Were the proper tools available?
- ☐ ☐ Were the proper tools on site?
- ☐ ☐ Were the tools properly maintained?

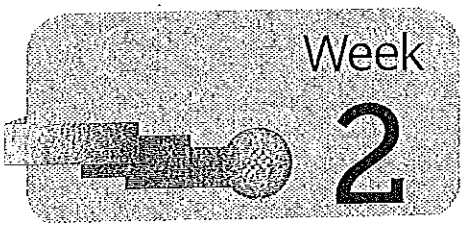
Y N **TRAINING/EXPERIENCE**
- ☐ ☐ Was employee trained for task?
- ☐ ☐ Was training documented?

Y N **LIFTING**
- ☐ ☐ Was the item under other equipment?
- ☐ ☐ Was the item stuck?
- ☐ ☐ Was the item too heavy?
- ☐ ☐ Was item in awkward position?
- ☐ ☐ Was help requested/received?
- ☐ ☐ Was help available?

Y N **PERSONAL PROTECTIVE EQUIPMENT**
- ☐ ☐ Was PPE available?
- ☐ ☐ Was PPE used?
- ☐ ☐ Was PPE appropriate for the job?
- ☐ ☐ Was PPE properly maintained?
- ☐ ☐ Were respirators used?
- ☐ ☐ Were employees trained in use of PPE?

Y N **SUPERVISION**
- ☐ ☐ Was supervisor at site?
- ☐ ☐ Was employee deficient in skill or ability?
- ☐ ☐ Has employee accomplished this task before?
- ☐ ☐ Employee had (__) mo/yr experience?

Y N **OTHER FACTORS**
- ☐ ☐ Were allergies, hearing, eyesight, or inadequate strength factors?
- ☐ ☐ Was fatigue a factor (overtime or second job)?
- ☐ ☐ Did employee suffer heat exhaustion?
- ☐ ☐ Was stress a factor (job or other)?
- ☐ ☐ Was lockout/tagout performed?



Avoiding Slips and Trips

Water utilities by their nature have many potential hazards that can cause slips, trips, and falls. These include slippery surfaces from water or liquid chemicals and tripping hazards, such as hoses, power cables, and irregular surfaces. US Department of Labor statistics show that slips, trips, and falls make up a majority of general industry accidents. Additionally, these types of incidents account for 15 percent of all accidental deaths and are the cause of 25 percent of all reported on-the-job injuries.

Reasons for Slips

Slips occur when there is too little friction or traction between feet (footwear) and the walking or working surface, resulting in loss of balance. Surfaces and situations that can cause slipping include the following:

- Metal surfaces, such as ramps and gang planks
- Mounting and dismounting vehicles, ladders, and equipment
- Loose, irregular surfaces such as gravel
- Highly polished or waxed floors
- Transitioning from one surface to another, such as concrete to tile
- Sloped, uneven, or muddy walking surfaces
- Loose, unanchored rugs or mats
- Loose floorboards or shifting tiles
- Wet, muddy, or greasy shoes
- Dry product or wet spills
- Natural hazards, such as ice, sand, leaves, and other plant debris

Reasons for Trips

Trips happen when the moving foot of a person strikes an object, causing loss of balance. Situations and materials that contribute to trips include the following:

- Uncovered hoses, cables, wires, or extension cords across aisles or walkways
- Clutter, obstacles in aisles, walkway, and work areas
- Open cabinet, file, or desk drawers and doors
- Changes in elevation or levels—as little as ¼-in. difference can cause a trip
- Unmarked steps or ramps
- Rumpled or rolled-up carpets/mats or carpets with curled edges
- Irregularities in walking surfaces
- Thresholds or gaps
- Missing or uneven floor tiles and bricks
- Uneven surfaces or objects protruding from walking surfaces
- Environmental conditions such as poor lighting, glare, shadows, excess noise, or temperature
- Bulky PPE, including improper footwear

While slips and trips are caused by irregularities in the pathway of a worker, inadequate awareness of those irregularities is a major contributor to most accidents. The human factor may be exacerbated by illness, poor vision, medications, or fatigue. Tripping and slipping can also be the result of carrying or moving cumbersome objects or too many objects at one time; walking while distracted by food, cellphones, or other devices; taking unapproved shortcuts, and rushing. All these factors can be controlled.

Institutional Control Measures

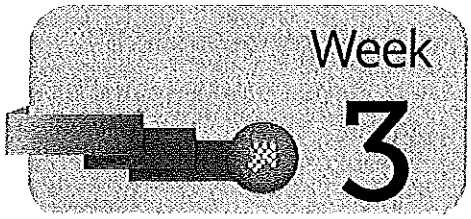
- Practice good housekeeping; maintain clear, tidy work areas free of clutter.
- Contain work processes to prevent discharge, splatter, or spillage of liquids, oils, particles, dusts onto walking surfaces.
- If obstacles can't be moved, mark them and reroute traffic around them.
- Secure all electrical and phone cords out of traffic areas; tape them to the floor or place them beneath a ramp.
- Keep work areas, aisles, stairwells, and pathways well lit.
- Mark/highlight step edges and transition areas (changes in elevations) with reflective tape and/or signage.

- Install slip-resistant floors in high-risk areas.
- Provide hand rails along narrow or uneven walkways and stairs.
- Provide effective drainage on work platforms.
- Keep aisles and passageways clear of obstructions and in good repair.
- Clear outside areas of natural hazards such as leaves, loose gravel, and snow. Treat slippery surfaces such as ice with sand or salt.
- Ensure that mats and carpets have nonskid backing and the edges aren't curling up.
- Install warning signs in areas prone to slipping, tripping, and falling hazards.

Personal Control Measures

- Follow safe routes—no shortcuts!
- Wear proper footwear, with appropriate treads/traction.
- Don't wear sunglasses in low-light areas.
- Don't carry items that obstruct your view.
- Use guardrails and handrails.
- Slow down and pay attention to where you are walking!

For more information see OSHA's recommendations on slips and falls: https://www.osha.gov/SLTC/etools/hospital/hazards/slips/slips.html, or visit the National Safety Council website on fall prevention: http://www.nsc.org/safety_home/HomeandRecreationalSafety/Falls/Pages/Falls.aspx.



Avoiding Arc Flash

Arc flashes or blasts pose a significant danger when working on or around electricity. Arc hazards in a water utility are most likely to come from switchboards, panel boards, and motor and industrial control centers. Workers at risk are those examining, servicing, or providing maintenance on these components.

Temperatures during an arc flash can reach as high as 35,000 degrees—nearly four times the temperature of the surface of the sun. Two thousand people each year are admitted to burn centers with severe arc flash injuries.

Arc flashes can injure or kill workers at distances of 15–20 ft. An arc flash can burn the skin directly and ignite a worker's clothing. Shrapnel, molten metal droplets, and particles are all dangerous elements of an arc flash or blast. These incidents can also result in hearing and respiratory damage, as well as eye and face injuries.

The threat goes beyond just the person working on the electrical piece of equipment; because arc flashes are so large and powerful, anyone in the immediate area is at risk.

How Arc Flashes Happen

An arc flash or burst occurs primarily while someone is working on an energized circuit. A flash can occur spontaneously or from bridging electrical contacts with a conducting object. This can happen if a worker drops a tool or accidently makes contact with the equipment. Excessive corrosion or a buildup of dust on the contact points can also spark an arc flash. An arc flash or blast can also occur simply because of an electrical equipment malfunction or failure.

Specific OSHA and National Fire Protection Association (NFPA) regulations and recommendations address arc flash safety on the work site. For example, visible labeling of electrical equipment, advising workers when "a dangerous condition associated with the possible release of energy caused by an electric arc" exists. OSHA mandates that only qualified persons are permitted to work on electrical conductors and circuits.

Avoiding Arc Flash

Have a written plan and permit system for conducting any work on or near energized equipment of more than 50 volts. The permit should list required conditions and work practices specific to the location of the work, the circuit and equipment involved, the hazard analysis, required PPE and tools, safe work practices, access control, and boundaries for approach by other workers.

Conduct a flash hazard analysis. Flash arc hazard boundaries and limits of approach are based on the voltage and is calculated using various formulas. It's important to establish and ensure an electrically safe work area, maintained throughout the work period. Properly test for voltage and grounding power conductors.

De-energize electrical equipment. Begin by thoroughly identifying all power sources. Then disconnect or interrupt that service when possible with a visual verification of the open circuit.

Follow proper lockout/tagout procedures. Visually verify the disconnect has opened the circuit, apply lockout tagout devices, test for the absence of voltage, and use ground phase conductors to counteract stored energy and induced voltage.

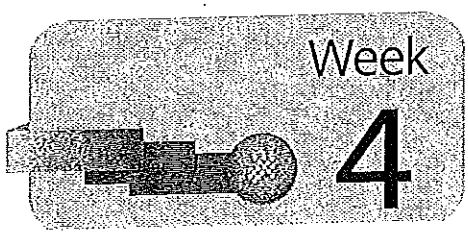
Wear appropriate PPE. Depending on the voltage present, arc flash safety guidelines may require safety glasses, hearing protection, flame resistant clothing, a full flash suit, face shield, a switching coat and hood, shoes and gloves. Protective clothing is "arc rated" depending on the anticipated hazard.

Use the proper tools. Use only double insulated tools. A high-visibility yellow layer provides insulation for the tool, and an outer high-visibility orange layer protects the lower layer. If the yellow underneath layer can be seen, the tool should be removed from service. These tools generally have a maximum safety rating of up to 1,000 volts to protect you from accidental contact, but are not designed to be used on energized circuits. Examine your tools before each use, keep them clean and dry, and have a qualified person recertify them periodically.

Additionally, when working with potentially energized equipment

- Position your body to the side and away as much as possible during switching.
- Avoid touching switchgear and metallic surfaces.
- Use metal-clad and arc-resistant switchgear and current-limiting power circuit breakers and reactors.

For more information, see the Workplace Safety Awareness Council pamphlet on arc flash: https://www.osha.gov/dte/grant_materials/fy07/sh-16615-07/arc_flash_handout.pdf.



Don't Get in a Bind with a Backhoe

The backhoe is a highly productive machine—the true workhorse for most projects involving trenching and earth moving. But a backhoe is also a complicated and dangerous machine that requires continuous vigilance during its operation. Backhoe operators have a responsibility to analyze and react to all situations in order to keep fellow workers safe and away from potential accidents.

The best way to operate a backhoe safely and efficiently is to understand the jobsite, the equipment, and, as a driver, yourself.

Before Starting Work

- Make sure the machine is fit for the task. Walk around the machine and inspect it with care. Look for damaged or missing parts, and check for fluid leaks, cracks, and excessive wear. Make sure the control levers are working properly.
- Select the right size bucket for the job. Make sure it matches the workload.
- Review the equipment's warning and safety signs. They are there for a reason. Take the signs seriously and heed their warnings. Replace any damaged or missing decals.
- Inspect the jobsite. Is it safe for the backhoe? Stake out the area to be excavated using marker flags. However, do not disturb the markings made by the underground utility locating service.
- Be sure to always look up for overhead power lines. If power lines are on the site, always keep them firmly in mind and point them out to your co-workers. Never allow a fully extended boom to get any closer than 10 ft from a power line—greater than 10 ft is even better! And never move the machine while the boom is elevated. Never work in areas that have inadequate overhead clearances. It is just too dangerous.
- Call before you dig! Did you call 811 two working days in advance so the locations of all underground utilities, in addition to water, are clearly marked at the construction site? Don't rely solely on your company's charts. You need to be certain.

- Be honest and ask yourself: Am I qualified to operate the equipment? To be a qualified backhoe operator, you should not only have mastery of the operating skills but also have strong sense of safety. Good operators will instinctively focus more on their safety sense than on their operating skills.

Backhoe Basics

A backhoe operator needs to know how to operate both a front-end loader and a backhoe scooper. The front-end loader is not as complicated as the backhoe attachment, but the operator must use a joystick control while simultaneously driving the tractor. The front-end loader will either remove excess dirt and material from the site or place it back in the trench. The front-mounted bucket can also tamp down loose soil and create a level grade.

Even though backhoe models vary, all have a few standard safety features. These include steps and grab handles for getting on and off of the machine. Frame lock levers and attachment levers keep the backhoe securely fastened to the loader frame during operation, as well as when it's being transported.

Some backhoes provide a safety chain to prevent the backhoe mounting frame from rotating backward and unexpectedly trapping the operator. Therefore, it is important to know and check all of the mounting and attachment points and the safety chain before you operate the backhoe.

Check the loader/backhoe to be sure the following safety devices are in good working order:

- Rollover protective structure (ROPS)
- Seat belt (if ROPS equipped)
- Guards
- Shields
- Backup warning system
- Lights and mirrors

The Right PPE

Wearing the appropriate PPE is important when operating a backhoe. In addition to sturdy pants and shirt, safety shoes, gloves, and a hard hat, the work may require:

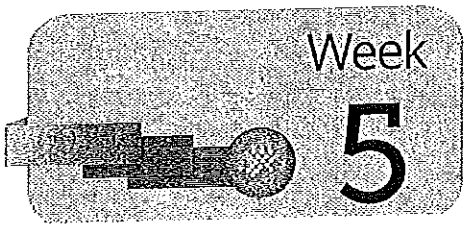
- Safety goggles or glasses
- Hearing protection
- Respirator for dusty conditions

Operating the Backhoe

- Operate the backhoe only from the seat.

- Always lower the stabilizer feet to provide extra grip and leverage. Level the machine for maximum stability.
- Keep bystanders and other workers out of the bucket swing area. Always be aware if other people are around you and where they are standing.
- Make sure there's enough clearance to swing the loader bucket to one side for dumping. Keep the bucket low to the ground.
- Double-check the lock on the backhoe attachment.
- Never swing the bucket over a truck cab.
- Dump the bucket uphill if possible when operating on a slope. If you must dump downhill, swing slowly to avoid tipping the machine.
- If using the backhoe as a hoist, do so with the weight over the back of the machine—never to the side—to avoid tipping.
- Be sure the load you are lifting is balanced, and move the boom slowly to avoid swaying the load.
- About every 8 hours, grease all of the Zerk fittings. Check the hydraulic fluid and oil daily. If the fluid is low, the backhoe will not operate properly.
- Anytime you leave the operator seat or lower the bucket or attachment to the ground, turn the engine off and remove the ignition key.

Many heavy equipment manufacturers have free backhoe safety videos on YouTube and safety tips on their sites, and OSHA has a student backhoe safety manual online at http://www.oshacampus.com/PDF/Loader_Backhoe/Loader_Backhoe_Student_Manual.pdf.



Be Kind to Your Body:
Stretch Before Working

Utility work can be a physically demanding job. It frequently requires some workers to spend considerable time in awkward postures. Athletes need to warm up before the start of a workout or competition, and so do utility workers. This includes office staff as well as field workers! Through stretching you can prepare your muscles to handle the load and possibly prevent the more frequent forms of work injury: sprains and strains.

Before the start of your shift, or before heading out to the field, take a few moments to stretch. A few simple movements help increase circulation and reduce fatigue—plus you might even become more relaxed! A stretch break any time during the day will also help you feel better and work better.

Why Stretch?

A flexible body is crucial for physical activity—whether it's for sports or for work. Stretching increases flexibility, minimizes the chances of pulling or tearing muscles, and improves performance. A flexible muscle can react and contract faster, and with more force. Flexibility also increases agility and balance.

Here are a few tips to help you get the most out of stretching and exercise:

- Start out easy. If you haven't been regularly exercising, don't try to do too much in the beginning.
- Stretch regularly. Make it a routine at the beginning of every work shift.
- The warm-up should not be painful, but you should definitely feel the stretching and the working of all the muscles and joints.
- Hold each stretch for 10 seconds. Do not bounce. Breathe normally during the stretch.

Here are some easy stretching exercises:

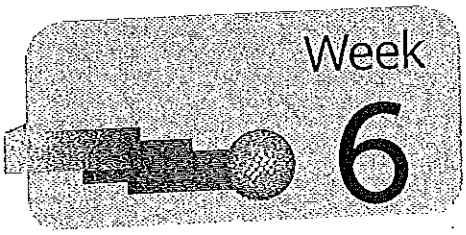
- Neck rotation: Turn your head to the side, stretching your chin toward your shoulder. Turn head back to center and repeat to the other side. Increase the range of the stretch by dropping the opposite shoulder. See if you can lower your head further.

- Shoulder stretch: Stand with feet shoulder-width apart. Raise one arm overhead and stretch as far as you can without bending the torso. Repeat with opposite arm.
- Forearm stretch: Extend your right arm straight out in front of you, palm downward. With the left hand, grasp the fingers of the right hand and pull back gently, stretching wrist and forearm. Repeat with the left arm.
- Tricep stretch: Raise one arm straight up, so your upper arm is near your ear. Bend your arm at the elbow and let your hand fall to the back of your neck. With the other arm, reach behind your head and place your hand on top of the bent elbow. Gently pull down and back on the elbow. Repeat with other arm.
- Trunk stretch: Stand with your feet a little more than shoulder-width apart. Reach your left arm overhead and bend to the right at the waist. Repeat on the opposite side.
- Torso twist: Stand at arm's length from the wall, with the wall at your side. Reach one arm out and place your hand on the wall. Reach the other arm around the body, stretching the hand to the wall. Repeat on opposite side.

Pain and discomfort probably mean you did too much. Back off a little, and if pain persists check with your doctor.

For more information see Mayo Clinic's websites on stretching: www.mayoclinic.com/health/stretching/WL00030 and www.mayoclinic.com/health/stretching/SM00043.

Additional Notes



Be Prepared for an Emergency

Fire. Flood. Tornado. Hurricane. Storm surge. Earthquake. You never know when an emergency situation may force you to leave your home or work to deal with disaster situations. In the event of a major disaster, you and your family should realistically plan to be self-sufficient for at least seven days before outside resources are available. A little preparation now could save lives and prevent injuries in the future.

Escape routes. Every room in your house should have two designated escape routes. The whole family needs to know, understand, and practice the escape routes, especially children.

Evacuation plans. Massive evacuations caused by fire, hurricanes, and flooding are becoming more and more common. You may have only minutes to leave. So be ready to move!

- If you know there might be trouble soon, keep a full tank of gas in your car and only take one car per family to evacuate.
- Gather disaster supplies (see below) and have a battery-powered radio for official evacuation instructions. Don't forget the extra batteries!
- Before you leave, lock up your home and unplug everything except the freezer and refrigerator.
- Let others know where you're going, leave early to avoid being trapped, and follow recommended evacuation routes. Don't take shortcuts—they may be blocked!

Family communications. Your family may not be together when a disaster strikes, so plan how you will contact one another in emergency situations. Pick a friend or relative who lives out of state for family members to notify that they are safe.

Utility shutoff. Every adult needs to know how to shut off the utilities: natural gas, water, and electricity. Because different gas meter configurations gas have different shutoff procedures, contact your gas utility for guidance on preparation and response.

Food. Prepare in advance a week's worth of nonperishable food supplies for every family member. Try to avoid foods that will make you thirsty. Choose salt-free crackers, whole-grain cereals, and canned foods with high liquid content. Stock canned foods, dry mixes,

and other staples that do not require refrigeration, cooking, water, or special preparation. You may already have many of these on hand. Be sure to include foods that meet special dietary needs. And do not forget a manual can opener!

Water. Water can become a precious resource after a disaster. Keep an emergency water supply ample enough to meet the needs of the entire family for seven days or longer. Also plan on having enough water to meet your family's personal hygiene and sanitation needs.

Important documents. Store documents such as insurance policies, deeds, birth certificates, and property records in a bank safety deposit box away from home. Make copies for your disaster supply kit. Keep a small amount of cash or traveler's checks where you can quickly get to it.

Special needs. A family member with a disability or a special need may require additional assistance in an emergency. Find out what assistance is available in your community and be sure to inform the local office of emergency services and the fire department about your family's special needs.

Pets. If you must evacuate, don't leave your pets behind! They may not survive on their own, and you may not be able to find them when you return. Create a pet-survival kit that includes essential supplies such as food, water, and medications. For more information, contact the Humane Society of America.

Safety skills. Family members should know how to administer first aid and cardiopulmonary resuscitation (CPR). The American Red Cross frequently provides first-aid and CPR classes. Everyone should also know how to use a fire extinguisher; your home should have an ABC-type extinguisher.

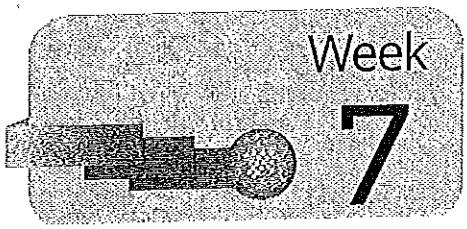
Shelter. You may want to consider having sheltering supplies such as tarps, tents, and sleeping bags ready to go.

Emergency kit for work. This kit should be in one container and ready to grab and go in you are evacuated from your workplace. Besides food and water in the kit, have comfortable walking shoes in case an evacuation requires you to walk long distances.

Emergency kit for your car. In case you are stranded, keep a kit of emergency supplies in your car. This kit should contain food, water, first-aid supplies, flares, jumper cables, and seasonal supplies.

Change stored food and water supplies in all your kits every six months and write the date on all containers. You'll also need to rethink your supply needs every year and update your kit as your family needs change.

For more information check out the Federal Emergency Management Agency website: ready.gov, the American Red Cross website: www.redcross.org, and your community's emergency service organizations.



Biohazards and Worker Safety

What are biohazards? Simply put, they are biological agents and/or conditions that pose a risk to human health. Animal feces from dogs, rodents, and birds can all transmit diseases to humans if not handled and cleaned up properly. Bloodborne pathogens, human waste, and drug paraphernalia are also considered biohazards and can pose a significant health threat.

Five sources of biohazard risk to human health include the following:

- Bacteria (e.g., *E. coli* and *Salmonella*)
- Fungi (e.g., mold and yeast)
- Viruses (e.g., hepatitis, HIV)
- Pathogens (e.g., *Giardia* and *Cryptosporidium*)
- Endotoxins (from decaying debris)

Four ways in which the human body can be affected by a biohazard include

- Ingestion (eating, swallowing)
- Inhalation (breathing or smelling)
- Contact (through broken skin or mucous membrane)
- Injection (stuck with a sharp object such as a needle)

Workplace Preparedness

If your work typically brings you into close proximity to biohazardous materials, you likely already know the potential safety and environmental risks and the safe handling procedures. But it's essential that everyone in the area knows what to do in a biohazard emergency, both during the emergency and afterward, during cleanup.

A properly outfitted work area contains a safety shower, an eye wash station, and a hand-washing sink as permanent fixtures. There should also be at least one well-stocked

biohazard spill kit containing goggles, gloves, shoe covers, breathing masks, biohazard waste bags, disinfectants, sharp-instrument containers, and instruments for picking up sharp tools or objects such as broken glass. The kit should also contain absorbent material designed specifically for handling common biohazards, such as blood.

Be sure everyone is familiar with the biohazard safety procedures, the contents of the spill kit, the instructions for using the kit, and any SDS that may be included.

Recognizing the Threat

Most people don't know what type of condition is considered a biohazard and are unprepared to safely deal with biohazards.

Let's say for example that a co-worker receives a serious cut while on the job. Exposure to the blood from that cut could be a problem because in the general population, 1 in 300 people are HIV positive; 1 in 20 have hepatitis; 1 in 5 have herpes; and 1 in 3 have some type of bloodborne disease, according to the CDC. What's more, the CDC says hepatitis B virus can survive for at least one week in dried blood. The virus may survive on environmental surfaces, contaminated needles, and/or instruments.

Diseases from air- and blood-borne pathogens or feces are spread most often to humans during cleanup because of improper safety equipment. For example, Hantavirus is transmitted by infected rodents. Individuals become infected with Hantavirus by breathing aerosolized urine, droppings, saliva, or nesting materials. A specialized respiratory mask (one that filters viruses) should be used when cleaning suspected nesting areas and rodent feces.

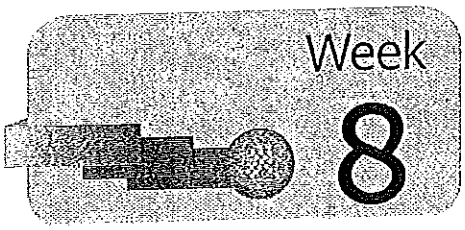
Proper Cleanup Procedures

It is especially important to adhere closely to the biohazard cleanup laws. They are imposed by multiple agencies to protect the public's health and safety. OSHA is one of the agencies that sets standards in biohazard cleanup laws. According to OSHA, "Personnel associated with the biological cleanup must be trained, immunized, and properly equipped to do so."

Biohazard restoration includes cleaning not only the visible but also the invisible. The standard for cleaning and restoration of biohazards is set by the American Bio-Recovery Association. As a general rule, for any blood or fluids, all visible areas should be cleaned, including all materials surrounding the affected area. When it comes to porous materials such as drywall, sometimes it is necessary to replace the drywall in that area. Cleaning of biohazard areas should include all surfaces—walls, ceilings, carpets, flooring, fixtures, switches, railings, and trim—using chemicals produced specifically to kill microorganisms.

Disposing of biohazard materials after cleanup is regulated by USEPA, OSHA, and state and local governments. All of the guidelines and regulations are written with the specific intent of lowering your infectious risks and keeping you from contracting or spreading disease.

For more information go to the OSHA website on biological agents, https://www.osha.gov/SLTC/biologicalagents, or CDC's website on biosafety, http://www.cdc.gov/biosafety. See also the AWWA book, *Environmental Compliance Guidebook: Beyond US Water Quality Regulations.*



Carbon Monoxide: A Silent Killer

- *Water gushing from a 30-inch pipe near the University of California poured into Pauley Pavilion, and six people helping clean up the flooded arena were treated for carbon monoxide exposure from generator exhaust.*
- *Carbon monoxide leaking from a faulty flue pipe attached to a water heater killed the manager and sickened 27 others at a restaurant in New York.*
- *Downed power lines from ice storms in Northeast and Midwest forced hundreds of thousands to spend the holidays without electricity, and carbon monoxide from gasoline-powered generators is blamed for eight deaths.*
- *A 77-year-old man was found dead his home after leaving his car running in the garage.*

These true stories are just a fraction of the deaths and illnesses reported every year from carbon monoxide (CO) poisoning. CO exposure can occur on the job, as well as in homes and buildings that are inadequately ventilated and lack the proper detection devices. CO poisoning has affected people using gasoline-powered tools such as concrete cutting saws, high-pressure washers, floor buffers, welders, pumps, compressors, and generators. These incidents occur most often when these tools are operated indoors.

Carbon monoxide is an odorless, tasteless, colorless gas produced by the incomplete combustion of carbon-based fuels such as gasoline, natural gas, fuel oil, charcoal, or wood. Because of the potential for CO poisoning, small gasoline-powered engines and tools present a serious health hazard when operated indoors or in an enclosed space. CO can rapidly accumulate even in areas that appear to be well ventilated. Buildup can lead to dangerous or fatal concentrations within minutes. Opening doors and windows or operating fans does *not* guarantee safety.

Health Effects of Carbon Monoxide

Carbon monoxide interferes with the delivery of oxygen in the blood to the rest of the body. When you inhale high concentrations of CO, it can displace the oxygen in your bloodstream and cause one or more of the following symptoms:

- Poor coordination

- Confusion and disorientation
- Fatigue
- Nausea
- Headache
- Dizziness
- Weakness
- Visual disturbances
- Changes in personality
- Loss of consciousness

If the concentration is high enough and the exposure is long enough, CO exposure can lead to death. Approximately 1,000 people die each year as a result of CO poisoning, according to the CDC.

Prevention Techniques

In the workplace, the CDC has the following recommendations to prevent CO poisoning:

- Do not use or operate gasoline-powered engines or tools inside buildings or in partially enclosed areas.
- Learn to recognize the symptoms and signs of CO overexposure.
- Always place pumps, power units, and gasoline-powered compressors outdoors and away from air intakes so that engine exhaust is not drawn indoors where the work is being done.
- Consider using tools powered by electricity or compressed air if they are available and can be used safely.
- Use personal CO monitors where potential sources of CO exist. These monitors should be equipped with audible alarms to warn workers when CO concentrations are too high or when exceeding the NIOSH ceiling limit for CO of 200 parts per million.
- Conduct a workplace assessment to identify all potential sources of CO exposure.
- Educate workers about the sources and conditions that may result in CO poisoning as well as the symptoms and control of CO exposure.
- Monitor employee CO exposure to determine the extent of the hazard.

Additionally,

- Always use the proper fuel in a combustion device.

- Don't leave a motor vehicle or gasoline-powered lawn mower running in enclosed spaces such as a garage or shed.

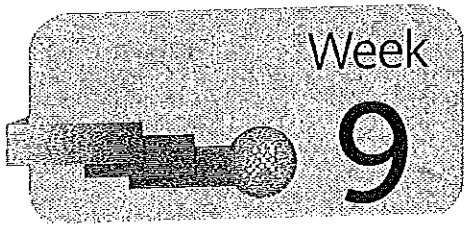
First Aid for CO Exposure

If you have any symptoms, or notice that a co-worker is impaired, immediately turn off the equipment and go outdoors or to a place with uncontaminated air.

- Call 911 or another local emergency number for medical attention or assistance if symptoms occur. Be sure and tell the first responder that you suspect carbon monoxide poisoning.
- Stay away from the work area until tools are deactivated and measured CO concentrations are below accepted guidelines and standards.
- Watch co-workers for the signs of CO toxicity.
- If you are affected by CO, do not drive a motor vehicle—get someone else to drive you to a health care facility.

For more information go to the CDC fact sheet on CO: http://www.cdc.gov/co/pdfs/flyer_danger.pdf.

Additional Notes



Identify, Treat, and Prevent Carpal Tunnel Syndrome

That tingling or numbness you've ignored for months in your hand and wrist suddenly becomes a sharp, piercing lightning bolt that shoots through your wrist and up your arm. Is it just a passing cramp? More likely you have carpal tunnel syndrome (CTS)—a painful, progressive condition that affects roughly 1 out of 20 people. Its cause is compression of a key nerve in the wrist.

What Is Carpal Tunnel Syndrome?

Carpal tunnel syndrome occurs when the median nerve in your forearm gets squeezed as it passes through a narrow opening in the wrist called the carpal tunnel. Frequently, the pressure comes from the swelling of irritated tendons in the wrist area (due to over activity) or an injury such as a sprain or fracture. But, just as likely, the disorder can result from a congenital predisposition—the carpal tunnel is simply too small for the size of the median nerve. Other contributing factors may include mechanical problems in the wrist joint, work stress, and the repeated use of vibrating hand tools. CTS is also associated with pregnancy and diseases such as diabetes, thyroid disease, or rheumatoid arthritis. In some cases, no cause can be identified.

What Are the Symptoms?

The following symptoms typically start gradually and can be present in one or both hands:

- A tingling sensation or numbness in the thumb, palm, or fingers on one hand or on both hands
- Fingers that seem to be swollen, even with no visible swelling
- Pain that affects one or both hands or wrists
- Difficulty moving the fingers
- Symptoms that first appear at night, then during the day
- A weak grasp or grip

Who Is at Risk?

CTS usually occurs only in adults, and women are three times more likely than men to develop it, perhaps because the carpal tunnel itself may be smaller in women than in men. The dominant hand is usually affected first and produces the most severe pain. The risk of developing CTS is not confined to people in a single industry or job, but the syndrome is especially common in those performing work involving repetitive motion. Little evidence supports extensive computer use as a risk factor for CTS, although computer use may cause a different form of hand pain.

How Can It Be Prevented?

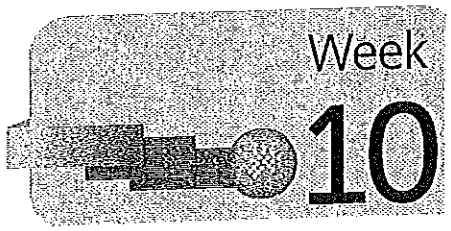
At the workplace, workers can do on-the-job conditioning, perform stretching exercises, take frequent rest breaks, and wear splints to keep wrists straight. A complete ergonomic evaluation of the workstation, tasks, and tools can promote changes that adapt the workplace conditions and job demands to alleviate the potential for CTS. However, research has not conclusively shown that these workplace changes prevent the occurrence of CTS.

What Are the Treatments?

Once diagnosed, treatments for CTS should begin as early as possible. Initial treatment generally involves resting the affected hand and wrist for at least two weeks, avoiding activities that may worsen symptoms, and immobilizing the wrist in a splint to avoid further damage from twisting or bending. Other treatments include the following:

- Drugs—In special circumstances, various drugs can ease the pain and swelling associated with CTS.
- Exercise—Stretching and strengthening exercises under the supervision of a professional physical therapist can be helpful in people whose symptoms have abated.
- Alternative therapies—Acupuncture and chiropractic care have benefited some patients but their effectiveness remains unproved. Yoga, however, has been shown to reduce pain and improve grip strength.
- Surgery—Carpal tunnel release is one of the most common surgical procedures in the United States. Surgery involves cutting the band of tissue around the wrist to reduce the pressure on the median nerve. Surgery is typically done under local anesthesia and does not require an overnight hospital stay. Many patients require surgery on both wrists. Although symptoms may be relieved immediately after surgery, full recovery from carpal tunnel surgery can take months. Recovery typically includes physical therapy. Some patients may need to adjust job duties or even change jobs after recovery.

For more information go to the CDC website on Ergonomics and Musculoskeletal Disorders: www.cdc.gov/niosh/topics/ergonomics, or the Mayo Clinic web page on the topic: www.mayoclinic.com/health/carpal-tunnel-syndrome/DS00326.



Don't Let Chemicals Get You!

Water utility operators and laboratory staff are often exposed to chemicals that can cause severe harm or even death. Many chemicals are extremely toxic, and even small quantities of them can be lethal.

The effects of chemical exposure can be local—at the point of contact—or systemic. Systemic exposure occurs when the chemical agent is absorbed into the bloodstream and distributed throughout the body, affecting one or more organs. If you are exposed to a toxic chemical, the severity of damage will depend on the toxicity of the substance, its solubility in tissue fluids, its concentration, and the duration of exposure.

A person can be exposed to dangerous chemicals in the following ways:

- Dermal contact
- Inhalation
- Ingestion
- Ocular exposure
- Injection

Dermal Contact

Spills and splashes in the laboratory or when loading chemicals into vats or mixing bays can result in contamination of exposed skin. When chemicals come in contact with the skin or the mucous membranes, they can cause surface irritation at best. At worst, the chemicals can be absorbed into the bloodstream, causing systemic poisoning. Chemicals primarily penetrate the skin through hair follicles, sebaceous glands, sweat glands, and cuts or abrasions. Touching contaminated hands to the mouth, nose, and eyes can also cause chemicals to be absorbed into the body.

Inhalation

Inhalation is the most common road of entry for toxic substances. Toxic vapors, mists, gases, and even dust and particulates can be absorbed through the mucous membranes of

the mouth and nose, and subsequently travel into the throat and lungs and cause serious damage to those tissues. The effects are further compounded if the substances pass through the lungs into the circulatory system.

Ingestion

Mouth pipetting in the laboratory can lead to the ingestion of chemicals, but an even more common cause of unintentional ingestion of toxic substances is from foods that were stored in containers, such as beverage jars, that had been used to store nonfood items (paint, plant food, or other substances). Another unsafe, but common practice that can lead to ingestion is storing food in a place where chemicals are stored or storing chemicals in a refrigerator used for food.

Ocular Exposure

Unprotected eyes can become contaminated by splashing, aerosol contamination, or from rubbing with contaminated hands. Many chemicals are capable of causing burns and loss of vision. Absorption into the bloodstream from ocular exposure can also occur quickly, because eyes contain many blood vessels.

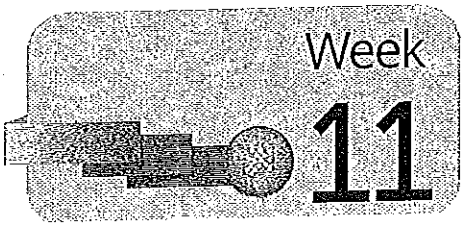
Injection

Inattentive laboratory workers can have accidents with needles; an accidental stick can inject chemicals into someone inadvertently. Broken glass containers that contained toxic chemicals can also cut through skin, exposing a worker's blood to unwanted contamination.

Avoiding Chemical Exposure

- Use PPE as required.
- Never eat, drink, or smoke while using hazardous chemicals.
- Always read the chemical's SDS prior to use.
- Make sure all chemical containers are properly labeled.
- Always wash up after using chemicals.
- Never smell or taste a chemical to identify it.
- Know and practice all emergency evacuation and containment procedures and equipment.
- Store all hazardous chemicals properly.
- Always use hazardous chemicals as intended.
- Avoid creating aerosols in the laboratory: do not use open vessels for processing chemicals.

For more information go to the US Chemical Safety Board's website: http://www.csb.gov.



Keeping Chemical Deliveries Safe

One of the most potentially dangerous activities at a water or wastewater plant is the delivery of hazardous chemicals. Injuries can occur when a chemical is delivered to the wrong container or the chemical is spilled. Serious injury can result when incompatible toxic chemicals are inadvertently mixed during delivery.

Safe chemical receiving and unloading procedures, practices, and management controls should be documented and practiced to ensure the safe delivery of chemicals to utility facilities.

While the supplier and shipper are responsible for ensuring the chemical load is properly identified, placarded, and transported, it is up to the staff of the receiving facility to ensure that

- the chemical is what was ordered,
- the chemical is offloaded safely to the proper place, and
- personnel are trained to handle the material correctly.

In addition, facility security protocols should be used to verify in advance who will be delivering the chemicals and in what manner. A chain of custody should always be maintained between the manufacturer and the purchaser. It is even common for some utilities to require background checks on the chemical delivery drivers for their specific utility.

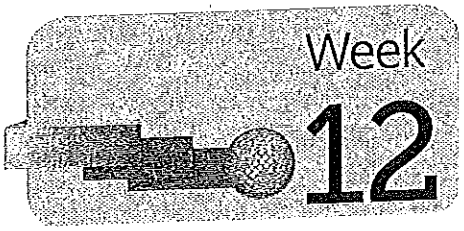
While every chemical has specific safety precautions that must be taken when inspecting and handling (and these are spelled out in the SDS), the following general procedures should be followed during the delivery and acceptance of any chemical:

1. Schedule the delivery so the proper personnel are on site when the chemical is delivered and the facility is ready to receive the delivery.
2. Confirm the identity of the delivery driver; verify he or she is who the supplier had scheduled to make the delivery and that the vehicle or cargo container is the same transport container that is listed on the manifest.
3. Verify the contents of the container. Read the placard, the bill of lading, and the SDS, and do any testing necessary. AWWA chemical standards state, "Each product shall be

identified as to product, grade, net weight, name and address of the manufacturer, and brand name. Packages or containers shall show a lot number and identification of manufacturer. All markings on packaged, containerized, or bulk shipments shall conform to applicable laws and regulations, including requirements established by OSHA. Bulk quantities of product should be sealed with a uniquely numbered tamper-evident seal(s).

4. Wear any and all required PPE.
5. Inspect transferring hoses, valves, and recipient containers for damage, plugging, or wear, and replace as necessary.
6. Have a trained attendant oversee the unloading of cargo tanks. This person must be alert and
   - have a clear view of the cargo tank,
   - be within 25 ft of the tank,
   - be aware of the hazards,
   - know the procedures to follow in an emergency, and
   - be authorized to move the cargo tank and be able to do so if necessary.
7. Inspect the actual container or pipe that the product should be loaded into and/or through, and be sure the receptacle is clear of all potential contaminants.
8. Unhook all loading/unloading connections before coupling, uncoupling, or moving a chemical cargo tank. Always chock trailers and semitrailers to prevent motion after the trailers are dropped.
9. Unless the engine must run a pump for product transfer, turn if off when loading or unloading.
10. Ground tanks correctly before filling them with flammable materials through an open filling hole. Ground the tank before opening the filling hole, and maintain the ground until the filling hole is closed.
11. Close all manholes and valves before moving a tank carrying hazardous materials. It does not matter how small the amount in the tank or how short the distance, manholes and valves must be closed.
12. Keep liquid discharge valves on a compressed gas tank closed except when loading and unloading.
13. Ensure that any necessary lockout/tagout procedures are followed.
14. Know what to do in the event of a spill or chemical release, or individual exposure to a chemical.

For more information go to American Chemistry Society's website: www.americanchemistry.com/Safety/TransportationSafety, or the US Chemical Safety Board's website: www.csb.gov.



Climbing Elevated Tanks:
The Height of Safety

The dangers of climbing elevated water storage structures should never be underestimated. Utility staff often must climb structures higher than 12 ft when climbing towers to check paint, look for rust or bullet damage, and inspect hatches, locks, and beacon lights. Without protection, the workers face falling several stories. Even if a worker is roped in, a fall in a safety harness can cause a loss of circulation and whiplash. Injury or sudden illness could also incapacitate an employee while he or she is working on a tower, requiring an emergency evacuation.

A qualified high-angle safety trainer can teach staff proper climbing techniques and how to use safety climbing ropes and harnesses, as well as how to correctly handle a fall.

Some water structures have fall-arrest rails on their ladders so a climber merely attaches a rail-riding "slider" device into a D-ring on the harness the climber wears for protection. On older structures, however, climbers manually snap-hook lanyards onto the ladder's side rails—not its rungs—and maintain three points of contact (both hands and one alternating foot) while moving.

The transitions from ladder onto overhead catwalk or from ladder through a hatch (and vice versa) are the most dangerous parts of any climb. Climbers should always attach a fall-arrest lanyard onto good, thick steel before making a transition, or while working topside around an open hatch or near the edge.

The physical exertion involved in utility-tower climbing should not be underestimated. For the average person in reasonably good condition, it can be a full-body workout—especially if carrying an extra load, such as electrician's tools attached to 15 or so pounds of harness and other PPE.

Climbers should always use the buddy system. Someone, even a nonclimber on the ground, should be on-site to phone 911 immediately if a climber gets into trouble and cannot get down.

Standard operating procedures for climbing any elevated structure should include these safety guidelines:

- Only personnel who have a legitimate need to climb and have completed basic climbing instruction with practical exercises are allowed to climb any water structure more than 12 ft high.
- Climbers must inspect and then don proper fall-arrest equipment, including a full-body harness, double lanyards with one-hand operation, and an ascender/descender (slider) device if the structure is equipped with a fall-arrest rail in good working condition.
- Hard hats must be worn at altitude and on the ground.
- Climbers must never ascend a structure while on-site alone. At a minimum, an employee with a cellphone or radio must be stationed on the ground, with the climber in visual and/or shouting range. Otherwise, climbers must employ a buddy system of two or more trained personnel at altitude.

Additionally, Rope and Rescue School, whose motto is Knowledge = Safety, provides these tips to tower climbers:

- Don't be cocky or a show-off, or have a competitive attitude when working at heights.
- If you are tired, take a rest. Fatigued muscles don't respond as quickly.
- Do not work above people and do not let people work above you.
- Warm up. You'll feel stronger and lighter, protect yourself from injuries, and improve your aerobic threshold and general endurance.
- Empty your pockets of possible objects that can turn into projectiles.
- Start hydrated and stay hydrated.
- Stay 100 percent tied in while climbing, descending, working in position, and maneuvering around the tower.

If an emergency arises, the ground-safety staffer or fellow climber is responsible for phoning 911. The emergency caller must

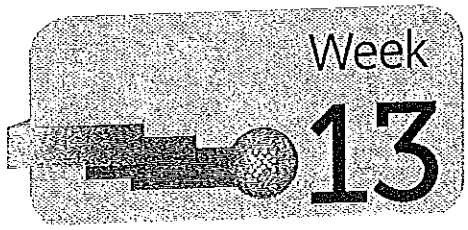
- specify the address of the emergency,
- describe the nature of the problem, and
- identify the urgent need for "high-angle rescue and EMS."

If a climber gets into trouble and is incapacitated, the second person must not leave the structure until the stricken climber is down. The ground-safety staffer or fellow climber should provide rescue personnel with an approximate duration of time since the climber fell to help assess the medical effects of restricted blood circulation in the victim's limbs from hanging in a full-body harness.

If a climber slips and falls, engaging the fall-arrest system, his or her body harness (and lanyard, too, if used) has been "shock loaded." After the climber returns to the ground, the harness can no longer be worn and must be taken out of service, as specified by the PPE manufacturer.

For more information go to the OSHA website on fall protection: www.osha.gov/SLTC/fallprotection.

Additional Notes



The Safe Use of Compressed Air

When we think of pressure, we think of power. And with the use of power, inherent dangers are often present. Such is the case when we work with one of the most useful tools of the workplace—compressed air.

Compressed air is at work around the clock, performing countless jobs from filling tires, lubricating trucks, and operating lifts, to the breaking, jacking, auguring, and tamping of earth and rock on construction projects. Compressed air helps us complete our jobs better and faster. This discussion is geared to its use and the dangers of its misuse.

Using a compressed-air hose as a toy is particularly hazardous, especially if the air stream is brought into close or direct contact with any portion of a worker's body or clothing. If this occurs and there is a break in the skin, air may be forced into the bloodstream, often with fatal results.

Air in the bloodstream is just one way compressed air can injure a worker. There are others. The majority of injuries are caused by either carelessness or lack of training.

Using compressed air to clean clothing, tools, or workbenches can result in foreign bodies in workers' eyes. Using compressed air for cleaning is not only an unsafe practice, but more a hindrance than help, because it spreads dust and chips around, which eventually results in a larger cleanup area.

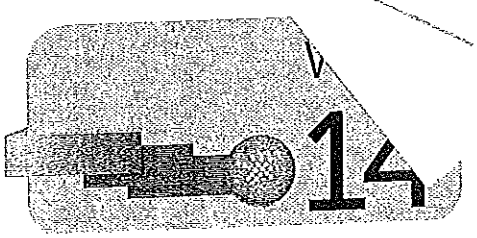
Unfastened safety chains on air-hose lines account for more injuries than any other type of compressed-air accident. Hose couplings can be handled pretty roughly on construction jobs—e.g., dragged over the ground or streets—which can lead to the disconnection of couplings. That's why a safety chain must be connected from one hose to the other at each connection. Once an unchained hose is accidentally disconnected, escaping high-pressure air can whip the hose around with terrific force, causing the hose to strike anything in its path.

Safety Tips for Using Compressed Air

- Wear eye protection whenever you use compressed air.
- Check the hose carefully to see that it is in good shape, free from cuts and abrasions, before you open a valve leading to an air hose.
- Make sure the trigger or operating valve on the tool is closed.
- Check the run of the line to see that it is protected from possible damage and is not a tripping hazard.
- Be sure the valve is closed on the supply side of the coupling before changing the tool at the end of a compressed air line. No matter where the valve is—close it. Never simply kink the hose.
- After closing the valve, pull the trigger or open the operating valve to release the line pressure. Then make the required tool change.

Practice these safety measures when working with compressed air. Remember, there is power in pressure—and power means extra precaution.

Additional Notes



Climb into Confined-Space Safety

A confined space is any area with limited entry and exit that contains known or potential hazards and is not intended for continuous human occupancy. In the water community, these spaces include manholes, trenches, storage tanks, wells, vaults, tunnels, and trenches. Hazards within a confined space include:

- Oxygen deficiency by displacement with other gases and the introduction of nitrogen from cable pressurization
- Toxic gases from decomposing soil, chemical spills, and engine combustion exhaust (from vehicles and equipment)
- Combustible or flammable vapors and gases from underground storage or piping facilities
- Moving equipment parts, structural hazards, entanglement, slips, and falls
- Temperature extremes, including atmospheric and surface
- Shifting or collapse of bulk material
- Barrier failure resulting in a flood or release of free-flowing solids
- Uncontrolled energy including electrical shock or water pressure
- Visibility
- Biological hazards

The buildup of gases, including carbon monoxide and radon, poses one of the most common and lethal dangers in confined spaces. If an oxygen deficiency or hazardous atmosphere may exist in the work area, the air must be tested before employees enter and also while the work is being conducted. If necessary, ventilation must be provided and continued as long as the manhole or vault is open. If the confined space is vacated for any period of time, such as a lunch break, the atmosphere should be retested before re-entry is allowed.

Safety Equipment

Several pieces of equipment are required for safe entry into a confined space:

- Work-area protection devices, such as traffic (reflective) vests, traffic cones, manhole guards, work-area protection signs
- Manhole cover lifter and manhole hook
- Atmospheric tester for combustible gas, oxygen deficiency, and other toxics
- Power ventilator (blower)
- Pump to remove water
- First aid kit
- Portable fire extinguisher (dry chemical)

Atmospheric Conditions

The air within the confined space must be tested prior to entry into the space. Atmospheric conditions are considered unacceptable if oxygen levels are less than 19.5 percent or greater than 22.0 percent. The following levels of other hazards are unacceptable:

- A flammable gas, vapor, or mist greater than 10 percent of its lower flammable limit (LFL). LFL means the minimum concentration of the flammable material that will ignite if an ignition source is present.
- An airborne combustible dust at a concentration that obscures vision at a distance of five feet or less
- An atmospheric concentration of a substance greater than the allowed limit in the SDS for that substance

Testing Procedures

After all work-area protection devices are in place and the atmospheric test equipment has been tested as operational:

- Lower the sampling hose approximately 6 inches through the hold in the manhole cover to make the first pre-entry test. If no combustible gas is found, remove the cover and proceed. If the flammable gas concentration is above 60 percent LEL (lower explosive limit), suspend operations and follow company procedures.
- After the manhole cover is removed, continue to test for combustible gas by lowering the sampling tube within 12 inches of the manhole or vault floor. If no flammable gas is found, purge the manhole with the power blower for the period of time based on the blower capacity and manhole configuration, following company procedures.

Ventilation

If flammable gas is detected and is above 10 percent but below 60 percent LEL, purge and ventilate the manhole for a minimum of 10 minutes, depending on the manhole or vault size. If combustible gas was detected but subsequently cleared, continue to monitor and ventilate to maintain the flammable gas level below 10 percent LEL.

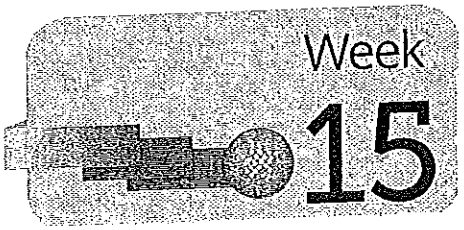
When ventilating a manhole, insert the blower hose in the manhole opening, positioning the blower hose to direct the flow of air horizontally, midway between the manhole's floor and roof toward an end-wall, and away from the work area, if possible. To minimize the intake of exhaust fumes from passing vehicles, the blower intake should be positioned away from the flow of traffic. Wind direction also must be considered. Ventilation of the manhole must continue as long as the manhole is open to avoid the possible development of a hazardous atmosphere.

If the confined space is vacated for any period of time, the atmosphere of the confined space should be retested before re-entry is permitted. Further testing should be conducted with ventilation systems turned on to ensure that contaminants are removed and the ventilation system is not causing a hazardous condition.

Remember, when entering any manhole, follow the written confined-space entry procedures.

For more information go to the OSHA website: www.osha.gov/SLTC/confinedspaces.

Additional Notes



Build In Construction Site Safety

Whether you are a utility field worker, inspector, manager, or supervisor, sooner or later you will work at, or visit, a busy construction site. When you do, keep in mind that a construction site can be the most hazardous environment in which you will ever work. Typical hazards include:

- Heavy equipment
- High traffic areas
- Flying debris

Heavy Equipment Movement

On any construction site, you are likely to find heavy equipment such as backhoes, front-end loaders, and dump trucks. The best way to prevent injuries from these large machines is to keep your distance. However, when you can't keep a safe distance, remember these few simple rules:

- Make eye contact with the equipment operator.
- Listen for backup alarms.
- Watch out for pinch points and dump trucks.
- Always have an escape route in mind.

Traffic Movement

Most construction sites make it a priority to safely move heavy equipment traffic around the site. When you enter a site, talk to the project manager about equipment movement and then mark your work area with plenty of cones, signs, and flashing arrows. If possible, park a vehicle between you and the rest of the construction site. As an added precaution, point the wheels in the direction you want your vehicle to roll if it is struck.

Make one person responsible for maintaining traffic control. Truck drivers who move in a out of the site regularly are often the best candidates.

Flying Debris

Watch out for flying debris such as sparks, metal scraps, hot hydraulic fluids, dirt, and roc These can be launched toward you at any time, so make it a habit to be vigilant of your su roundings and to always wear safety glasses when on-site.

Maintain a safe distance from flammable materials when using a saw or grinder, and posi tion your work so sparks fly away from flammables. But also watch out for how sparks m affect co-workers.

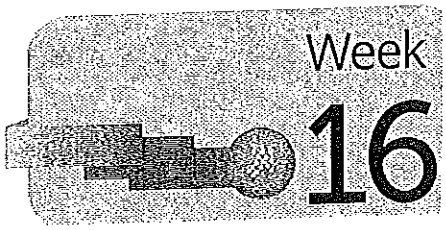
Watch for small pieces of metal flying off flaring tools or hammered pieces of steel. To pre vent this hazard, grind off any burrs on the piece of metal being worked. Broken hydraulic hoses on heavy equipment can expel hot hydraulic fluid (another reason to keep your dis- tance from heavy equipment).

Keep the Site Neat

What is true around the office or at home is also true on a construction site—a little hous keeping can go a long way toward creating a safer site. Here are some recommendations:

- Keep the construction site as clean as possible. Pick up discarded scrap materials and debris, including wood, protruding nails, forms, and fasteners. Work areas, passagewa and stairs should especially be kept clear and free of debris.
- Provide separate waste containers for construction debris, office waste, and trash or garbage.
- Provide an appropriate container, with a lid, for hazardous wastes such as oily rags an flammable solvents.
- Keep incompatible materials separated.

For more information go to the OSHA Pocket Guide on Construction Safety: https://ww osha.gov/Publications/OSHA3252/3252.html.



CPR and AEDs Can Save Lives

Sudden cardiac arrest (SCA) is the sudden, unexpected loss of heart function, breathing, and consciousness. SCA occurs when the heart's electrical function—its ventricular fibrillation—is interrupted and stops the heart from pumping. SCA can also occur with a heart attack, which occurs when blood flow to a portion of the heart is blocked. Either way, without medical attention, the victim will die.

Of the nearly 300,000 people in the United States who suffer an out-of-hospital SCA, 92 percent die, according to the Centers for Disease Control and Prevention. What survivors have in common are early intervention with *cardio-pulmonary resuscitation* (CPR) and an *automatic external defibrillator* (AED), followed by rapid delivery of appropriate care—usually a trip to the emergency room.

SCA can be caused by:

- Heart attack and other cardiac conditions
- Electrocution
- Asphyxiation (loss of consciousness and death caused by inadequate oxygen in the work environment, such as in a confined space)
- Trauma, drowning, overdose, primary respiratory arrests, anaphylactic shock, and other noncardiac conditions

Many victims have no prior history of heart disease and are stricken without warning.

When someone goes down and suddenly loses consciousness, think CCCC – Clear, Check, Call, and Compress.

- *Clear* the area of other safety hazards. Make sure that the victim and you are safe from further harm.
- *Check* the victim for responsiveness. Has he stopped breathing or is he gasping irregularly for air? Does he respond at all to a hard slap on the shoulder blades?

- *Call* for help. If someone else is around, tell her to call 911 and find the nearest AED, if one is available. AEDs provide an electric shock that can restore normal rhythm to a hear in ventricular fibrillation.
- *Compress* the chest hard and fast. Push down straight down on the lower sternum, using one hand on top of the other at the rate of 100 times a minute.

Compressions are the most important part of CPR. New American Heart Association (AHA) guidelines no longer require the rescuer to provide life-saving breaths to the victim because compressions, done properly, will keep the blood circulating throughout the victim's body. There is enough oxygen in the blood of the victim to keep the heart, brain, and organs alive if it is circulated through chest compressions, and time spent assessing breathing is better spent compressing. This is known as *hands-only CPR.*

However, if you can provide breaths, or medical help isn't immediately available, then

1. Open the airway with a gentle head tilt and chin lift.
2. Pinch the victim's nose closed.
3. Take a normal breath, cover the victim's mouth with yours to create an airtight seal, and give two 1-second breaths as you watch for the chest to rise.

Staff trained in CPR and the use of an AED can save precious treatment time and improve survival odds because they provide aide before emergency medical service (EMS) personnel arrive.

Basic CPR can be learned in less than a day of training, and many businesses will either sponsor their staff to attend CPR classes or bring a professional in for the staff training. A person trained in CPR can assess if a victim needs to be treated with chest compressions and airway breaths, and then appropriately conduct these procedures.

Here's a step-by-step guide for the latest CPR:

1. Slap the victim's collarbones and call out to try to get the victim to respond. If the victim doesn't respond, gently roll the person onto his or her back.
2. Send someone to phone 911 and to get the nearest AED.
3. Start vigorous chest compressions in sets of 100; pause for no more than 10 seconds after two minutes or five cycles—or have someone else take over. Place the heel of your hand on the center of the victim's chest. Put the other hand on top and interlace the fingers. Press down so you compress the chest at least 2 inches for an adult or a child and 1.5 inches for an infant (with an infant, use only the pressure of 2–3 fingers). Give compressions of approximately 100 a minute or more (about the beat of the Bee Gees song "Stayin' Alive"). Let the chest return to its normal position between compressions.
4. Continue compressions until the AED or help arrives.
5. When the AED arrives, turn it on and follow the audio prompts.

Don't worry about pushing too hard. In fact, some rib bones will probably crack or break if you are correctly compressing the heart. Ribs are repairable, but when the heart stops, the absence of oxygenated blood can cause permanent brain damage within minutes. Death will occur within 8–10 minutes. For every minute that treatment is delayed, the survival rate drops 10 percent. The earlier CPR is initiated, the greater the chances of survival.

If help is provided within 4 minutes, chances of survival are doubled. These few minutes can be the difference between life and death.

NOTE: The AHA still recommends breaths with compressions and for infants and children and victims of drowning, drug overdose, or people who collapse due to breathing problems.

For more information go to the American Heart Association website: www.heart.org, or the American Red Cross: www.redcross.org/

Songs to Save a Heart

Each of these songs has a rhythm of about 100 beats a second.

"Stayin' Alive" by The Bee Gees

"I Will Survive" by Gloria Gaynor

"Ob-La-Di, Ob-La-Da (Life Goes On)" by The Beatles

"Kickstart My Heart" by Motley Crue

"Heartbreaker" by Mariah Carey

"Achy Breaky Heart" by Billy Ray Sirus

"Body Movin' " by the Beastie Boys

"Rock Your Body" by Justin Timberlake

"Hard To Handle" by The Black Crowes

"Breathless" by Maroon 5

"Do You Really Want To Hurt Me?" by Boy George

"Cecila" by Simon and Garfunkel

"Sweet Home Alabama" by Lynyrd Skynyrd

"Mmmbop" by Hanson

"Girls Just Wanna Have Fun" by Cyndi Lauper

"Another Brick in the Wall" by Pink Floyd

"Gives You Hell" by The All American Rejects

"Crazy" by Gnarls Barkley

"People Are Strange" by The Doors

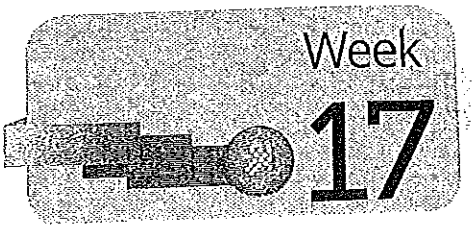
"What's Going On" by Marvin Gaye

"Dancing Queen" by ABBA

"Another One Bites The Dust" by Queen

"Jingle Bells"

"Nellie the Elephant"



Cutting Pipe Safely with Power Saws

Gas, hydraulic, and pneumatic saws are all used to cut utility water pipes. The main difference is the type of blade used. Depending on the situation and type of pipe, a specific blade may be required; some blades, such as diamond blades, will cut a variety of materials. So be sure to choose the proper saw and blade for the material, following the manufacturer's recommendations for the type of finish that is needed. Using a saw or blade not designed to efficiently cut through a material will usually damage the tool and create a safety hazard for its operator. Forcing a saw that is not big enough for the job can cause a kickback.

Users should be provided with specific tool training and have read the entire operating manual and manufacturer's guide for the specific saw used on the job.

Before Each Use

Carefully examine the cutting equipment. Look for the following:

- Worn bearings
- Damaged power cords
- Faulty on/off switches
- Loose bolts or nuts
- Lubricant leakage
- Evidence of excessive rust
- Broken or damaged housing or casing

Inspect the cutting blade or chain to ensure that it

- is sharp;
- is not crooked, bent, cracked, or split;
- rotates in the proper direction; and

- is securely fastened or bolted into place, and does not wiggle loosely if you try to tap or vibrate it gently by hand.

In addition, check the safety guards to make sure they are in place and secure and that the machine warning placards and labels are in place and legible. Follow the manufacturer's recommendations on blade replacement and preventive maintenance.

If the saw is damaged or if it needs servicing, put a tag on it indicating it should not be used. Mark on the tag what is wrong with the unit, and arrange to either have the unit repaired, serviced, or disposed of.

Before Cutting

- Make sure the saw is in the off position prior to plugging it in.
- Wear the appropriate PPE, including head protection with safety glasses and/or a face shield; hearing protection; respiratory protection if necessary; steel-toed safety shoes; close-fitting clothing and long trousers or, for chainsaws, special ballistic nylon reinforced chaps, pants, gloves, and boots.
- Properly support and chock the pipe to be cut so it won't move or flex during the cut.
- Fuel the saw, as appropriate, with the proper oil–gas mixture. Never gas, lubricate, or service a running machine.
- Clear the immediate area of people, tools, debris, and other obstacles.
- If work is taking place near traffic areas, wear high-visibility clothing and ensure that appropriate traffic management procedures are in place.

While Cutting

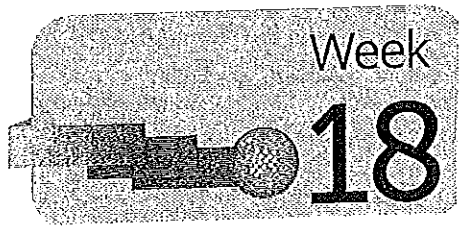
- Maintain good footing, with your feet shoulder-width apart.
- Keep the saw close to your body. Don't reach with the saw.
- Position your body as close to the pipe as possible. Don't reach with the cutting tool.
- Work with slow, controlled movements. Bend your knees if necessary.
- Don't rock the saw back and forth; allow the weight of the saw to help pace the cut. Never twist or turn the blade while cutting; make a straight, even cut.
- Work at a steady pace; never force the blade through the material.
- Stay concentrated on the task of cutting.

Other Safety Measures

- Always allow the saw to turn off, power down, and stop moving before you take your attention away from it. Never leave the machine unattended while running.

- Keep in mind that cutting and grinding is considered hot work. Never cut in the vicinity of flammable materials or in areas without proper ventilation.
- Have first aid kits, fire extinguishers, and emergency call numbers in close proximity at all times.
- Don't exceed the maximum operating speed recommended by the manufacturer, and never cut material not listed by the manufacturer of that saw and blade.
- The use of gas-powered pipe saws within excavations requires the use of ventilation equipment to prevent carbon monoxide accumulation.
- If a blade or saw appears to overheat, turn the tool off immediately and allow it to cool down. After it has cooled, check it carefully to make sure neither the saw nor blade has been damaged.

Additional Notes



Message to Self:
Distracted Driving Is Dangerous

Distracted driving is any activity that diverts a driver's attention away from the task of driving. These distractions can be electronic, such as text messaging or using a navigation system, tablet, or cellphone; or more conventional, such as talking to a passenger or eating. Other common distractions include grooming, reading, eating, drinking, watching a video, or changing the radio station, CD, or MP3 player. Because text messaging—texting—involves cognitive, visual, and manual attention, it has received the most legal attention in recent years, including legislative bans on texting while driving.

It's well documented in multiple university studies that drivers simply can't safely do two things at once. These studies concluded that motorists talking on a hand-held or even a hands-free cellular phone are as impaired as intoxicated drivers with a blood alcohol level of .08 (the minimum level that defines drunk driving in most states).

Here are a few eye-opening statistics from the National Highway Traffic Safety Administration (NHTSA) that may encourage drivers to limit their distractions:

- Drivers who use hand-held devices while driving are four times as likely to get into crashes serious enough to injure themselves or others.
- In 2012, an estimated 421,000 people were injured in motor vehicle crashes involving a distracted driver—a nine percent increase from the estimated 387,000 people injured in 2011.
- At any given daylight moment across America, approximately 660,000 drivers are using cellphones or manipulating electronic devices while driving.

Perhaps the most common distraction is cellphone use. About 89 percent (approximately 277 million) of Americans have a cellphone, and 77 percent of those individuals report that at least some of the time they talk on the phone while driving.

Distracted driving has risen to unprecedented levels, and state legislatures have taken action. Eleven states, the District of Columbia, and the Virgin Islands have banned handheld cell phone use for all drivers; and 41 states, the District of Columbia, and Guam have banned text messaging by all drivers.

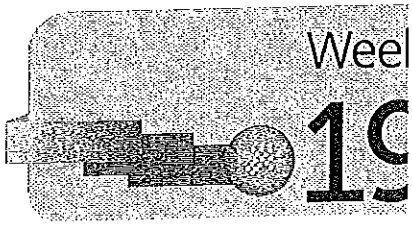
Everyone Has a Personal Responsibility

Common sense and personal responsibility are a big part of the solution. But the problem simply can't be legislated away. Many corporations and utilities have adopted strict hands-free driving policies for their employees. President Barack Obama issued an executive order in 2011 that prohibits more than 4 million federal employees from texting behind the wheel while working or while using government vehicles and communication devices.

More portable technology is available now than ever before, and driver distractions have risen to unprecedented and alarming levels. We live in a world where people expect instant, real-time information 24 hours a day, and those desires do not stop just because people get behind the wheel. Drivers don't always realize the dangers of taking their eyes and minds off the road, their hands off the wheel, and focusing on activities other than driving.

For more information go to the official US Government website for distracted driving: www.distraction.gov, or the National Safety Council website on the topic: http://www.nsc.org/learn/NSC-Initiatives/Pages/distracted-driving.aspx.

Additional Notes



Energized Electric Equipment Can Be Deadly

Utility workers often encounter situations in which they are required to work with energized electric tools or equipment. The most important thing to remember in these situations is to always consider the electric circuits, apparatus, and your tools to be energized and deadly. On average, a construction worker is electrocuted and killed once a day somewhere in the United States. And more than 3,000 field workers are severely burned or injured every year by electrical mishaps on the jobsite.

Electricity can hurt, burn, and kill you—even at low voltages. Always keep in mind that electricity travels at the speed of light and that it is trying to find the path of least resistance to get to ground. Your body is mostly made up of water and therefore is an excellent conductor of electricity. The effects of an electrical current passing through the body range from a mild tingling sensation to severe pain, muscular contractions, and even death. As the current passes through a body, it will burn from the inside out at about 6,000°F (3,315°C).

Beware of Overhead Power Lines

Before you begin work, survey the jobsite to find overhead power lines, poles, and guy wires. Look for lines that may be hidden by trees or buildings. Conditions change, so check daily.

- Point out power lines at the daily work briefings.
- Assume all overhead lines are energized and potentially dangerous, including service drops that run from utility poles to buildings.
- Remember the 10-ft rule: Keep vehicles, equipment, tools, scaffolding, and people at least 10 ft away from overhead power lines.
- If you must work closer than 10 ft, contact your local electric utility in advance to make safety arrangements.
- Higher-voltage power lines require greater clearance. Contact your local electric utility for specific clearances.
- Clearly mark boundaries to keep workers and equipment a safe distance from overhead lines.

- Use a spotter. Equipment operators need a designated spotter who can help keep you clear of power lines and other safety hazards.
- Call 811 before you dig.

Call your local dig alert service at 811 at least two working days before digging. If you don't call and you hit an underground line, you could be hurt or killed. You may also be liable for costly damages.

Avoiding Electrical Accidents and Shock

The easiest way to avoid electrical accidents is simply to avoid contact with energized components. Always presume that an electrical circuit is energized and dangerous until you are certain that it is not. Before working on a circuit, use a voltage meter to determine if the circuit is energized.

Before you work on electrical equipment, turn off the power to it. Use your standard lockout/tagout procedures before you begin working anywhere near the energized equipment.

To be safe, all electrical equipment and apparatuses must be double-insulated or grounded. If possible, avoid the use of extension cords. When extension devices (an enclosure with multiple sockets) must be temporarily used, the wire gauge of the device must be equal to or larger than the cord on the item being operated. Never attach extension devices to building surfaces using staples, nails, or similar attachments.

Extension devices equipped with surge protectors can be permanently used with equipment that contains microprocessors, such as computers; but surge protectors should not be used in areas subject to moisture, physical or chemical damage, or flammable vapors.

Follow these simple safeguards to avoid electric shock:

- Check your work area for water or wet surfaces near energized circuits. Water acts as a conductor and increases the potential for electrical shock.
- Check for metal pipes and posts that could become the path to ground if they are touched.
- Do not wear rings, watches, or other metal jewelry when performing work on or near electrical circuits. They are excellent conductors of electricity.
- Leather gloves will not protect you from electrical shock. They are cowhide, typically, and have inherent moisture in them.
- Never use metal ladders or uninsulated metal tools on or near energized circuits.
- Make it a daily habit to examine your electrical tools and equipment for signs of damage or deterioration. Do not use them if the electrical wires are damaged or if they are not insulated or grounded. Defective cords and plugs should be thrown away immediately and replaced.

Your local electric utility can provide you with specific safety information.

For more information go to OSHA's Safety and Health Topic page on electrical equipment: https://www.osha.gov/SLTC/electrical, or visit the Electrical Safety Foundation International website: www.esfi.org.

Additional Notes