

City of Gunnison Safety Manual

The practices contained in this manual are to be followed by all City of Gunnison personnel with the following exceptions:

The City of Gunnison Police Department personnel, City of Gunnison Fire Department personnel, and City of Gunnison employees serving on the Gunnison County Hazardous Materials Response Team will follow this manual except when the policy is in conflict with or is superseded by an existing policy written exclusively for that particular department.

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EMPLOYEE SAFETY AND HEALTH POLICY STATEMENT
November 6, 2007

Dear Fellow Employees:

The greatest priority of the City of Gunnison is that every employee is provided a safe and healthful workplace. In the course of any business conducted by city employees, all are required to adhere to company safety policies and procedures and follow all applicable State and Federal safety and health regulations.

The primary objective of this requirement is to prevent accidents and occupational diseases while conducting all of our operations safely and preventing injuries to employees, customers, and damage to property.

Each worker has ownership of their own safety and that of their fellow employees. They share the responsibility of managing safety with their supervisors to resolve safety issues before accidents occur. Most importantly, this cooperation helps foster an accident free attitude among employees. All employees, without exception, have a responsibility to themselves for their own safety as well as the safety of others.

The overall goal of this Safety Policy is to create an injury and illness free environment for all company employees by promoting positive health and safety attitudes. It is a full circle process targeting employee behavior by creating and maintaining a positive company safety culture, which in turn plays a major role in promoting a positive safety attitude among our employees.

Employees are encouraged to detect and report to their supervisor any hazardous conditions, practices, or behavior in their workplace and to make suggestions for their correction. The safety equipment provided shall be utilized and given proper care.

Please take your time to do each job safely and right. No job is so important - no order is so urgent - that we cannot take the time to perform our work safely.

Sincerely,

Ken Coleman
City Manager

SECTION I

GENERAL SAFETY RULES

1. Employees shall be in a physical and mental condition to conduct normal working activities. The use of prescription medications shall be reported to your supervisor.
2. The possession or use of alcohol and illegal drugs on city property is strictly prohibited. Refer to the Drug & Alcohol Free Workplace Policy
3. Fighting or horseplay is strictly prohibited.
4. Smoking is permitted only in designated areas.
5. Personal protective equipment shall be worn at all times when required by your supervisor or by safety regulations.
6. Good housekeeping practices shall be maintained at all times in City work areas.
7. All employees should learn the location of the nearest fire extinguisher and first aid kit. Notify your supervisor immediately if any of this equipment is missing, or has been used.
8. Familiarize yourself with the proper use of fire extinguishers. See #5 on pg 6.
9. Report missing or damaged equipment immediately to your supervisor.
10. All equipment used during the work day shall be de-energized and secured at the end of the day.
11. Hazardous wastes such as waste oils, hydraulic fluids, cleaning fluids etc. shall be disposed in a proper manner. Contact your supervisor for proper disposal procedures. Consult with Fire Hazardous Materials Coordinator for disposal problems.
12. All city speed limits and traffic signs shall be observed.
13. Report accidents immediately to your supervisor. Complete the necessary forms when reporting accidents.
14. Report any and all unsafe work situations to your supervisor.
15. In the event of an evacuation from a building immediately contact your supervisor so that a personnel count may be conducted. Return to work areas after receiving proper approval from your supervisor.
16. Use caution when lifting. Bend knees, and keep back straight. Leg muscles, not your back, should do the work. When lifting heavy loads, use lifting devices such as forklift, pallet truck, etc. or get help from other employees. Do not lift large objects in high winds. **DO NOT ATTEMPT TO LIFT LARGE/HEAVY LOADS BY YOURSELF.**
17. Do not interfere with other employees while they are using power tools, motorized equipment, or when they are working near electrical lines and equipment.
18. Use equipment with safeguards that are adequately designed and intended for normal operations.
19. Wrist watches, metal wrist bands, rings, or other jewelry shall not be worn while working near moving parts of machines or energized circuits.
20. Clean clothes are essential in preventing skin irritations. Clothing saturated with solvents or other materials contacting the skin greatly increase the possibility of a skin irritation. Clothing saturated or impregnated with flammable liquids, corrosive substances, toxic materials, irritants, or oxidizing agents shall be removed and shall not be worn until properly cleaned. It is recommended that employees working in areas of high contamination keep an extra set of work clothes on the job.

OFFICE SAFETY

1. Practice good housekeeping at all times in office areas.
2. Keep cords and other wiring covered so they do not become tripping hazards. Do not overload outlets by connecting too many items.
3. Keep equipment in good repair.
4. Do not block stairs, steps or doorways.
5. Clean up all spills immediately.
6. Use the proper ladder or stool for reaching high places, do not stand on chairs or furniture.
7. Follow proper lifting techniques when carrying large or awkward materials.
8. Practice sound electrical safety techniques when working with computers, typewriter, photocopiers, etc.
9. Keep all jewelry, clothing and hair out of the way of moving parts when working with computers, typewriters, photocopiers, etc.
10. Report unsafe situations to your supervisor immediately.
11. Report accidents and injuries immediately to your supervisor.
12. Know the Evacuation Plan for your particular office area.
13. Know the location of the nearest fire extinguisher, fire alarm, and first aid kit.

WORKPLACE VIOLENCE

Workplace violence includes Physical assaults, beatings, stabbings, shootings, rapes, attempting to cause physical harm, i.e., striking, pushing, or other aggressive acts against another person. Workplace violence can also be disorderly conduct, shouting, pushing or throwing objects, punching walls, or slamming doors; verbal threats to inflict bodily harm, including vague or overt threats; fascination with guns or weapons demonstrated by discussions or bringing weapons to workplace. City of Gunnison employees must know how to recognize the signs and immediately report these to Supervision.

1. Report any violence by strangers, customers, clients, co-workers or personal relationships to your Supervisor.
2. Employees working with the general public are usually at more risk.
3. Limit work where employees must work alone.
4. Limit work where employees must work at night.
5. Limit locations where assailants could hide.
6. Keep walkways and corridors adequately lit at night.
7. Patrol parking lots and areas when personnel must work at night.
8. Inspect your work area and identify potential dangerous locations.
9. Develop a training program to inform all City of Gunnison employees of the potential risks regarding workplace violence.

FIRE FIGHTING EQUIPMENT

1. Use fire extinguishers for emergencies only, unless otherwise approved for training purposes. If used for training, make sure that extinguishers are recharged.
2. Keep fire routes free from obstructions.
3. Report all fires immediately to your supervisor and call 911.
4. Fire fighting equipment will not be used for routine maintenance or operations work.

5. Personnel shall be trained in the proper use of fire extinguishers by their supervisor.
6. Keep fire equipment and exits free from obstructions.
7. Inspect fire extinguishers on a monthly basis.
8. Inspect buildings at least annually for presence of fire hazards, and review emergency evacuation routes and procedures.

PERSONAL PROTECTIVE EQUIPMENT

1. Personnel shall wear personal protective equipment that is consistent with the type of work conducted. This may include but is not limited to eye protection, hand protection, head protection, skin protection, hearing protection or respiratory protection. Use appropriate Material Safety Data Sheets, and contact your supervisor to determine what personal protective equipment is required.
2. Approved clothing appropriate for the work being done shall be worn and maintained in good repair. Loose sleeves, tails, ties, lapels, cuffs, or other loose clothing which can become entangled shall not be worn around moving machinery parts. Working without shirts shall not be permitted.
3. Any employee not using the personal protective equipment provided by the City, who is injured on the job and whose injury was caused by failure to use prescribed personal protective equipment, shall forfeit 50% of his/her workers' compensation benefits, pursuant to the Colorado Workers' Compensation Act, section 8-52-104.
4. Employees will wear hearing protection when working in areas marked with appropriate warning signs or upon instructions to do so by their supervisor.
5. Welders and their assistants shall wear approved eye protection during cutting, welding or brazing operations.
6. Respirators shall be worn as necessary. Supervisors shall ensure that employees are properly fitted and trained in the use of respiratory equipment.
7. Employees working in elevated work locations (greater than ten feet) shall wear safety belts and lanyards.
8. Safety vests or clothing bright orange in color and approved hard hats or soft caps shall be worn by all personnel while working on or near traveled right of ways.
9. Footwear shall be of substantial construction and the use of steel shank and safety toe shoes may be required as directed by supervisor.
10. Gloves shall be worn while collecting refuse and as directed by supervisor.
11. All personal protective equipment shall be kept clean, in good repair, and ready for use.

TRAFFIC AND MOTOR VEHICLE OPERATION

1. Employees operating motor vehicles will carry a current driver's license that is valid for the type of vehicle driven.
2. Personnel operating motorized equipment will be adequately trained in its use and operation. Relief drivers shall be designated and trained as replacements for regular drivers during vacation, sickness, etc. Their qualifications shall meet those stated for a regular driver. Equipment operation should not be assigned to an untrained junior member of a crew.
3. Employees are required to practice defensive driving at all times. Avoid accidents by anticipating that someone may step from between parked cars, that a car may pull out from the curb without warning, or that the driver ahead may turn or stop suddenly.

- Be alert; concentrate on safe driving. Employees shall drive courteously at all times and shall yield the right-of-way to other vehicles if there is any question as to which vehicle has the right-of-way.
4. No driver shall drive a company vehicle while their physical condition might impair their normal judgment.
 5. No person shall be allowed to drive company equipment unless he or she is an employee of the company and is authorized to use the vehicle. This rule shall apply to family members and friends of employees in charge of company vehicles.
 6. Equipment operators shall obey all speed limit and warning signs, drive their equipment at reasonable and proper speeds with due regard for weather and traffic conditions, intersections, and type of equipment driven.
 7. All employees operating lift trucks shall maintain proof of training.
 8. Lift trucks will be manned at all times when running.
 9. Tank trucks, semi-trucks or the like will be chocked, braked and the engine turned off during loading or unloading operations unless otherwise required for specific equipment operation.
 10. All vehicles in use shall be checked at the beginning of each shift to assure that the vehicle meets DOT requirements and that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use: service brakes, including trailer brake connections; parking system (hand brake); emergency stopping mechanism; coupling devices; seat belts; operating controls; and safety devices. all defects shall be corrected before the vehicle is placed in service. These requirements also apply to equipment such as lights, reflectors, windshield wipers, first aid kits, fire extinguishers, etc., where such equipment is necessary. Deficiencies must be reported immediately to your supervisor.
 11. Drivers shall not operate vehicles with inadequate brakes, faulty steering gear, horn, lights, etc., except to proceed to a place where repairs can be made, and then only at such reduced speed or, in such manner as will enable the movement to be made in safety. When known, mechanical defects shall be reported to the department team leader or to the company garage.
 12. Except for where specifically allowed by supervisors, employees will have their entire body inside the moving equipment at all times, and shall not enter or exit from moving vehicles or equipment.
 13. Before proceeding, employee drivers shall make certain that all loads are properly secured, that employees are so placed as to preclude being exposed to hazards from shifting loads or falls from the sides or end of the vehicle.
 14. Employees will not ride in buckets, Hi-Ranger lift baskets, forks (of lift trucks), etc. not designed to transport personnel while the vehicle is in motion.
 15. Employee drivers shall not permit boarding or alighting from vehicles which they are operating while such vehicles are in motion.
 16. Seat belts will be used in all vehicles, except as permitted by Colorado law for emergency vehicles, sanitation vehicles, and for meter reading operations. The belt shall be fastened before moving the vehicle.
 17. Loads shall be properly secured and protected before proceeding. All loads should be checked to prevent spill-off due to overloading.
 18. The driver shall inspect his or her footwear before driving a vehicle and see that his or her footwear is free of mud, excessive water, oil or grease, to prevent a slippery contact with brake and clutch pedals.

19. Vehicles shall not be operated with dirty or damaged windshields and mirrors, inadequate brakes, faulty steering gear, horn or lights.
20. The brakes and other safety systems shall be tested by the operator before leaving on the first trip of the day and any deficiencies noted and corrected. When required, DOT inspection logs shall be properly filled out and kept in the vehicle.
21. Operators of mobile equipment, forklifts, motor vehicles, golf carts and similar equipment shall not be permitted to use headphones while operating equipment. Portable or vehicle mounted radios, tape, or CD players shall not be played so loud as to interfere with similar warning sounds.
22. The severe application of brakes, especially booster brakes, shall be avoided except in an emergency. The operator must at all times have the vehicle under control so as to be able to bring it to a complete stop within the assured clear distance ahead.
23. No vehicle shall be parked on a hill or grade unless the front wheels are turned into the curb or the wheels securely chocked.
24. No vehicle shall be driven on a downgrade with gears in neutral or clutch disengaged.
25. Employee drivers shall not permit more employees to ride on seats than the number for which the seats were constructed.
26. All tools and equipment shall be properly guarded, stowed, and securely fastened when transported. All doors of cabinets and lockers must be latched before moving truck.
27. Crowding or pushing when boarding or leaving any vehicle or other conveyance is prohibited.
28. When possible do not load and unload a vehicle from the street side of the load.
29. Special regulations and instructions governing the loading and unloading of poles, pipes, etc., shall be strictly observed in every case.
30. The vehicle hood shall be secure at all times when it is raised. When it has been lowered into position it shall be checked to determine that it is completely latched.
31. Vehicles provided with tail gates shall not proceed until the tail gates are secured.

TRUCK AND HEAVY EQUIPMENT OPERATION

1. Vehicles shall be loaded properly. The driver's view shall not be obstructed. Loads shall be properly fastened with ropes or binders. Materials transported on the same truck with workers shall be secured to prevent shifting.
2. Vehicles shall be kept free from accumulation of materials that constitute hazards from tripping, obstructions, or fire. Sufficient clearance shall be allowed for access to material and tools. All surfaces shall be kept free from protruding nails or bolts, splinters, loose boards, and unnecessary holes or openings.
3. Good housekeeping shall be maintained at frequent and regular intervals. All sweepings, solid or liquid waste, refuse and garbage shall be removed and disposed of in proper receptacles as often as necessary or appropriate to maintain equipment in a sanitary condition.
4. When winches on trucks or tractors are used to raise or lower poles or material, pull in wire, etc., the operator shall not leave the controls while the winch is in operation or is being used to hold a load. Another employee should act as observer for the winch operator.
5. Moving of company trucks and other vehicles equipped with booms or derricks, truck mounted ladders, mechanical or hydraulic lifts, hole diggers, or similar equipment in

- an elevated or partially elevated position is prohibited unless the equipment is so designed.
6. Proper precautions shall be taken at all times to prevent contact with overhead lines, trees, or structures.
 7. Safety chains will be used on all trailer equipment except semi-trailers coupled with a standard fifth-wheel.
 8. Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.
 9. Heavy machinery, equipment or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment shall be either fully lowered or locked when being repaired or when not in use. All controls shall be in a neutral position with the motors stopped and brakes set, unless work being performed requires otherwise, and then only when other suitable precautions are instituted.
 10. A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices. (See charts and instructions provided per OSHA 29CFR 1910.177.)

VEHICLE BACKING OPERATIONS

1. Introduction
Driving large trucks, in general, is a challenge to any professional driver -- but backing is the toughest and most hazardous operation. Backing accidents are the source of some of the most costly and heartbreaking accidents in the workplace. City employees consequently should use extra care and precaution in backing.
2. Four major backing precautions
 - A. Before you start backing, make sure you can see where you are going. See that the way is clear. Get out and inspect the area immediately behind your vehicle.
 - B. After seeing that the way is clear, then back very slowly. Never back in a hurry.
 - C. Alert other drivers or pedestrians who may be in, or about to cross your path of travel by blowing your horn. Be careful, though. They may not understand your intentions. Extraordinary precautions shall be taken when driving motor vehicles near children.
 - D. All bi-directional machines, such as hoists, front end loaders, trenchers, and similar equipment shall have in operation a reverse signal alarm distinguishable from the surrounding noise level.
 - E. If you have a loader or helper working on your crew, always have the helper direct you in the backing up operation. Only one person, however, should be giving the backing signals.
3. Helper's position
 - A. The helper's body must face in the direction of the driver at all times when signaling.
 - B. The helper must be in a position where the driver can see him directly or in either of the rear view mirrors.

- C. The helper must be on the ground in a position that gives him an unobstructed view of the ground over which the truck is about to be moved.
 - D. Wherever possible, the helper should station himself at the point where the backing maneuver is to end, so that he avoids the hazards of walking backward over the surfaces he does not see.
 - E. The helper must position himself to observe the most immediate hazard to the truck. This may require stopping the truck and changing positions one or more times.
4. Suggested backing signals by loader or helper
- A. Stop--Raise the right hand above the shoulder with open palm facing the driver.
 - B. Back--With the right hand raised above the head with the palm of the hand turned inward, roll the arm and hand in a slow circular motion counter--clockwise (toward the body).
 - C. Go forward--Raise the right hand above the shoulder and with the index finger pointing ahead, repeatedly move the hand in a forward motion.
 - D. Move to the right--Raise the right hand above the shoulder and with the thumb pointing to the right, make the repeated motions to the right.
 - E. Move to the left--Raise your right hand above the shoulder and with the index finger extended to the left, make repeated motions to the left with your hand.
- Note:** Even though there is someone directing, drivers are not relieved of their responsibility. It is still up to them to see that the backing operation is done safely.
5. Summary
- A. Don't be in a hurry to back your vehicle. Back only when necessary. If there is any other way of driving to your objective, do it rather than by backing. Plan - or help management to plan your route to eliminate all unnecessary backing.
 - B. Prior to backing, check the path of your truck to make sure the way is clear. If you can't see where you are going, get out and look. Check all clearances, on the right side, left side, front, back, and top of your truck. Do this as often as is necessary to do a safe job of backing.
 - C. Back your vehicle slowly and cautiously. Make sure you have absolute control of your vehicle at all times.
 - D. Use a helper, or the closed circuit backing system on your truck to guide you in your backing operation. Be sure your helper understands how to give the necessary signals. Keep him in your view at all times.
- Final Note:** Equipment operators should remember that bad weather can reduce visibility, or cause a road surface to become slippery from rain, snow, or ice, presenting a greater hazard in backing operations.

CELLULAR PHONE USE IN CITY VEHICLES

Distracted drivers are more likely to make a driving error or react too slowly. As more City drivers are using cellular phones, it is important that they be used safely and courteously. Currently, there is no law or City policy against using a cellular phone while driving, but you could be charged with dangerous or careless driving if you cause an accident while using

one, and cellular phone use is frequently cited by other drivers as an annoyance or hazard because distracted cell phone users often behave more erratically. It is important both for safety and for the image of City drivers that common sense and courtesy be followed in using Cellular phones while in City of Gunnison vehicles.

Guidelines for Cellular Phone Use in Vehicles:

1. Whenever possible, use your cellular phone when parked, or have a passenger use the phone.
2. If your position requires frequent cell phone use in a vehicle, you should have voice mail service and hands-free equipment for your phone, and use both to avoid distractions.
3. If your phone rings when you are driving – especially during hazardous conditions -- let your cellular voice mail service take the call and listen to the message later when you are parked, or pull over before answering, if traffic conditions permit.
4. Make sure the phone is easy to see and reach: Place your cellular phone in your vehicle where you can grab it without removing your eyes from the road.
5. Suspend conversations during hazardous driving conditions or situations.
6. Let the person you are speaking to know you are driving and that the call may need to be suspended at any time.
7. Do not take notes or look up phone numbers while driving. As a driver, your first responsibility is to pay attention to the road. Common sense dictates you do not read, look up an address or attempt to write or take notes while driving.
8. Attempt to dial and place all calls when you are not moving.
9. When possible, plan your calls before you begin your trip, or call when your vehicle is parked at a stop sign or red light. If you absolutely need to dial while driving, assess the traffic and dial only a few numbers at a time.
10. Learn and use the pre-programmed number dial features of your phone. Practice using this feature for commonly dialed numbers before driving so you are familiar with the procedures.
11. Do not engage in stressful or emotional conversations while driving. A stressful or emotional phone conversation while driving is distracting and potentially dangerous. If necessary, suspend the phone conversation.
12. Use your cellular phone to call for help or to help others in emergencies. Your cellular phone lets you be a "good Samaritan" in the community. If you see an auto accident, crime in progress or other serious emergency where lives are in danger, call 911 and give the exact location and information to fire, police or ambulance personnel.

MATERIAL HANDLING AND STORAGE

1. Store and stack material so that the load is stable. Floors and platforms supporting loads must be properly constructed to support the loads.
2. When moving material with lift trucks, make sure the load is balanced and stable.
3. Do not exceed load carrying capacity of vehicles being used.
4. Store and stack material in approved locations. Make sure all aisle widths conform to uniform Fire Code and uniform Building Code.
5. Keep aisles, stairways, exits, fire equipment, water heaters, boilers, electric panels and switch boxes well marked.
6. Do not store materials where exits, fire fighting equipment, emergency equipment, ladders, walkways or roadways may be obstructed.

7. Do not store materials near sources of combustion or electrical equipment.
8. Maintain a clear view when moving loads.
9. Sharp or pointed articles shall be so stored as to prevent contact with the sharp edges and points. Remove nails, exposed wire and other hazards associated with packing devices after materials have been stored.
10. Determine that storage areas above offices and store rooms will adequately support the material to be stored.
11. Be sure that flammables are stored a safe distance from occupied or office areas.

HOUSEKEEPING

1. Keep all work areas orderly and clean.
2. Keep aisles and passageways clear and accessible.
3. Clean up all spills and/or leaks.
4. Place rags and other materials in approved containers.
5. At the end of the work day or upon completion of a job remove all tools and excess materials, and barricade the area if necessary.
6. Maintain all storage areas in a clean and organized manner. Remove all packing material after products have been adequately stored.

HAND TOOLS

1. Select the proper tool for the work intended.
2. Use tools that are in good repair. Replace any damaged tools immediately.
3. Powered electrical tools are required to have a grounding plug or be double insulated.
4. Tools should be inspected before each use.
5. Secure tools when transporting them in vehicles.

POWER TOOLS

1. Carefully read instructions before using power tools.
2. Ground all tools before using them, and do not alter three prong grounding plugs.
3. Use the correct tool for the job.
4. Do not disconnect tools by pulling on the cord.
5. Do not use equipment with frayed or damaged cords.
6. Avoid using power tools in wet situations whenever possible.
7. Do not change bits, blades, etc. when the tool is energized. Unplug the tool before making changes.
8. Do not operate power tools without guards.
9. Wear eye protection when using power tools.
10. Fuses and other over current protection shall be maintained in all circuits. Circuits on which power tools are used shall not exceed 20 amperes rating unless otherwise approved in the City-County Electrical Code.
11. Extension cords shall not be used as a substitute for fixed wiring of a structure or building. Electrical outlets should be installed where needed.
12. Do not leave the cords of portable electric tools where cars or trucks will run over them.

LADDERS

1. Ladders shall be in good repair and used in their intended manner.
2. Wooden ladders shall not be painted.
3. Ladders shall be placed so that the base is one (1) foot out for every four (4) feet of height.
4. Ladders shall be properly secured and equipped with shoes at the bottom to prevent slippage.
5. Always climb and descend facing the ladder. Ladders are not to be used as scaffolds.
6. Only one (1) person shall work on a ladder at a time.
7. Metal ladders shall not be used near electrical lines, electrical cabinets, or energized equipment.
8. Modified ladders shall be approved by your supervisor before they are to be used.
9. Benches, boxes and other materials shall not be used in place of a ladder.
10. Damaged ladders will be repaired or discarded.
11. Ladders should be inspected prior to each use, and repaired or taken out of service if not up to standards.
12. Ladders should not be placed in front of doors unless the doors can be secured.
13. Materials should not be carried by hand when ascending and descending a ladder.

SCAFFOLDS

1. All scaffolding shall be installed by qualified individuals.
2. All scaffolding shall be constructed of approved materials in an approved manner, per OSHA Standard 1926.451.
3. Scaffolding shall be equipped with toe boards and guardrails in locations greater than ten (10) feet.
4. Safety belts and lanyards shall be used if scaffolding cannot be provided with guardrails.
5. Scaffolding shall be equipped with a ladder to facilitate access.
6. Scaffold boards shall not be painted.
7. Mobile scaffolds shall not be moved while personnel are located on them.
8. Metal scaffolds shall not be used in or near electrical lines or equipment.

BARRICADES AND WORK AREA PROTECTION

Working in traffic exposes employees to extreme danger. Construction and maintenance work on streets and roadways can result in hazards to workers, motorists, and citizens alike. Since the risk of injury or death in such work is significant, certain safeguards must be instituted to minimize the risks.

Manual on Uniform Traffic Control Devices (MUTCD)

All City work zone set-ups must conform to the MUTCD. Published by the Federal Highway Administration, the MUTCD is the standard manual for signs, barricades, lights, and warning devices used to protect work areas under construction in the roadway. Supervisors are responsible for assuring that employees doing job site set-ups are trained in its provisions. Failure to protect a work zone according to MUTCD specifications leaves the City open to liability claims. (Copies of the Manual can be obtained by contacting the Superintendent of Documents, US Government Printing Office, Washington DC 20402, stock # 050-001-00308-2.)

Planning

Before undertaking any construction, planning must be done. With minor jobs such planning may be minimal. Larger projects may require considerable planning efforts. As a minimum, consideration must be given to the hazards that passing motorists may pose to workers, and the hazards that the construction may pose to passing motorists. Also, does the work pose any risks to pedestrians or by-standers? How much of the roadway will need to be blocked off? Where should work vehicles and equipment be placed? Will the construction be left open at night? Will flaggers be necessary? Will visibility be a problem to motorists? In answering such questions by referring to the MUTCD, potential risks can be identified and appropriate steps can be taken to control such risks.

Training

Training is essential if employees are to be expected to set up a work zone in conformance with the MUTCD, and to work safely within the work zone. Supervisors should assure that they and their workers receive proper training through at least one of several sources available, including the Colorado Contractors Association, the American Traffic Safety Services Association, and the Colorado Transportation Information Program through Colorado State University, and CIRSA, the risk sharing pool for Colorado municipalities.

PERSONAL PROTECTIVE EQUIPMENT

1. Safety vests or clothing bright orange in color and approved hard hats or soft caps shall be worn by all personnel while working on or near traveled right of ways.
2. Vests should be equipped with reflective tape that is visible at night.
3. A hard hat should be worn whenever there is exposure from overhead work to impact, or from falling or flying objects, or to electrical shock and burns. Hats should be of a color that enhances visibility, and may be equipped with reflective tape for enhanced night visibility.
4. Other personal protective equipment may be required depending on the type of work being done. The object is to make workers as visible as possible to motorists, especially if work is required at night.

PROTECTION OF THE PUBLIC

1. Work areas should be properly protected for safety of the public. Signs and barricades shall be erected in such a way as to warn of the existence of a hazard, and prevent or minimize entry into hazardous areas.
2. Barricades with warning tape, signs, flags, cones or other approved devices must be erected to restrict access in an area where hazards to traffic or pedestrians may exist. This could include a subsurface or overhead hazard.
3. Excavations or open manholes, or the like shall be adequately barricaded.
4. Warning lights may be installed, or visible barricades erected if openings are left overnight.

WORKING OVERHEAD

1. When working overhead, take precautions to protect personnel working below. Loose materials, tools and the like must not be left in places where they can be knocked, blown or vibrated off-balance and fall.

2. Rope off or barricade the area below the overhead work to prevent access to non-working personnel.
3. Do not drop or throw material, tools or supplies from overhead work areas.
4. Use a tag line to lift heavy or awkward loads.

CRANES, HOISTS, ETC.

1. Inspect the hoist or crane before work begins.
2. Inspect chains, chokers, etc. before securing to load.
3. Fasten chains, chokers, etc. securely to the load.
4. Use tag lines for heavy or awkward loads.
5. Keep all personnel away from the area below the boom or load.
6. Barricade beneath the swing radius of the boom.
7. Only one person shall give directions to the equipment operator.
8. When equipment is left unattended, its block and load shall be secured and the equipment de-energized.
9. Personnel shall be adequately trained in the use of hoists, cranes, etc.
10. Repair and/or maintenance of chains, chokers, hoists, etc. shall be conducted by a qualified individual.
11. Personnel shall not be lifted or lowered with a crane unless proper equipment is utilized. Contact your supervisor for additional instructions.

MANUAL LIFTING

1. Inspect the path that must be traveled when lifting. Where possible, remove obstacles from path.
2. Back support belts will be made available to employees and should be used when lifting. In certain situations, belt use is mandatory: consult your supervisor.
3. Use powered equipment whenever possible to avoid unnecessary back strain.
4. When you must lift heavy materials, use the following procedures:
 - A. Separate and place both feet close to the object lifted.
 - B. Bend knees and squat down to the object to be lifted.
 - C. Grip the object with the palms of the hands.
 - D. Position the arms and elbows close to the body.
 - E. Draw the chin towards the chest to straighten the back and lift with the back in a vertical position.
 - F. When shifting a load, turn the feet but do not twist the trunk.
5. When two or more individuals are lifting a load, use signals to coordinate the lift so that an injury does not result.

COMPRESSED GAS CYLINDERS

1. Store all cylinders in upright and fastened positions. (except 1 ton cylinders designed for horizontal storage.)
2. Place the protective cap on cylinders when they are not being used.
3. Keep stored oxygen cylinders at least twenty (20) feet from acetylene cylinders and other flammables.

4. Always check the label or stencil on the cylinder to make certain you have the proper gas.
5. Never use oil or grease as a lubricant on valves or attachments of oxygen cylinders.
6. Do not store cylinders next to heat sources.
7. Always transport cylinders in a secured, upright manner.
8. Tag or label all cylinders that are empty and remove them from the workplace.

LOCK, TAG AND TRY

1. Review the specific Lock, Tag and Try Procedure of the particular location before beginning work.
2. All voltages shall be handled properly and safely.
3. Only qualified individuals will work on live or energized equipment.
4. When working on live equipment, work on only one (1) wire at a time and insulate all conductors which may come in contact with the live circuit.
5. Adequate personal protective equipment must be used when working on live circuits.
6. Use only nonconductive ladders and hard hats when working near energized circuits.
7. Treat all electrical equipment as though it was live.
8. Shut off power before removing guards from motor-driven equipment.
9. Keep the work area as dry as possible.
10. Fuses shall be replaced with fuses of the proper capacity.
11. Finger rings, bracelets or metal watch bands shall not be worn when working with electrical equipment.
12. When opening disconnects, wear proper eye protection to shield the eyes from the flash or sparks.
13. When opening disconnects wear approved hand protection, such as linesman gloves.
14. After repairs, replace cover plates on lighting and power cabinets or electrical enclosures.
15. Restrict the number of people in the work area.
16. Inspect all electrical extension cords for signs of wear.
17. Extension cords shall not be used as permanent wiring in any situation.
18. Ground all electrical power tools.
19. Only qualified individuals shall be allowed to repair electrical equipment.
20. Do not pull on the cord to disconnect equipment.
21. All portable equipment shall be grounded by means of a three wire cord and polarized plug or wire leading from the frame of a machine to a good return ground. OSHA approved insulated portable power tools may be used. Grounding plugs shall not be altered.

WELDING, CUTTING OR BRAZING

1. Inspect the area to assure that flammable or combustible materials are not present.
2. Inspect the equipment to be worked upon before the work begins. Drums, barrels or small containers shall be thoroughly cleaned before the work begins.
3. All storage tanks or vessels must be clean, gas free, and blinded before the work begins. Mechanical ventilation shall be provided in any space less than 10 cubic feet per welder or any other confined space where natural cross ventilation is restricted. Ventilation shall be at a rate of at least 2,000 cubic feet per minute.

4. When working inside a vessel, welding gasses which are not in current use shall be turned off both at the nozzles and the cylinders to prevent leakage and gas buildup.
5. Test the area for flammable or combustible materials before re-entering after taking any breaks.
6. Test the area for flammable or combustible materials at the beginning of each shift if work is going on continuously.
7. A fire watch shall be assigned to all cutting or welding operations that are conducted outdoors or in the vicinity of any flammables.
8. A fire extinguishers shall be made readily available during all cutting or welding operations. The fire watch and employees doing welding or cutting shall be familiar with the operation of a fire extinguisher.
9. Report any fire that results during a cutting or welding operation.
10. Welding shields shall be used if the work is conducted in a high activity area, for protection of passersby. When working in welding areas, employee shall avoid looking at an electric arc without eye protection. Serious eye injury could result.
11. Personnel will wear appropriate eye and skin protection, including gloves, and approved helmet or goggles for the type of operation performed.
12. Welding and/or cutting cylinders will be operated in a standing position, with cylinders properly secured.
13. Keep grease and oil away from oxygen cylinders. Never let grease or oil, even on your hands get near oxygen cylinder controls; the combination forms a highly explosive mixture.
14. Open valves on welding and/or cutting cylinders slowly. Before connecting a regulator to a cylinder valve, the valve should be opened slightly and closed immediately. (This is termed "cracking" and is done to purge the valve of dust or dirt that might enter the regulator.) Stand to one side of the outlet, not in front of it, when cracking the valve.
15. When an oxygen cylinder is in use, valves shall always be opened completely. Valves shall be turned "OFF" when not in use.
16. Replace caps and properly store empty welding and/or cutting cylinders. Oxygen cylinders in storage shall be separated from fuel gas cylinders (and other combustibles) by at least 20 feet or separated by a 30 minute fire resistive barrier of at least 5 feet high.
17. Practice good housekeeping techniques at all times in welding and cutting areas.
18. Properly ventilate any welding area. Check ventilation equipment annually to make sure air flow is adequate.
19. Use Acetylene only at pressures below 15 pounds per square inch. At higher pressures the gas is unstable and may explode.
20. Do not use copper tubing to repair acetylene hose. Acetylene will attack pure, unalloyed copper, forming a very explosive powder, copper acetylide.
21. Never strike an arc on, or tap an electrode against, a cylinder.
22. Always use a spark lighter to light a torch. Never use matches.
23. Never use oxygen to dust off clothing and the work area. Use fuel gases only for intended purpose.
24. All arc welding ground connections shall be mechanically strong and adequate for the required current.
25. When not in use, electrode holders shall be placed so that they cannot make electrical contact with persons, objects, fuel or compressed gas tanks.
26. Cables with splices within 10 feet of electrodes are prohibited from being used.

- 27. Cables with damaged insulation or exposed bare conductors shall be replaced.
- 28. The welder shall not coil or loop the electrode cable around parts of his body.
Do not leave welding rod stubs on the ground or floor where they may cause an accident.

HAZARD COMMUNICATION PROGRAM

The following introduction describes the purpose and scope of Hazard Communication programs as defined by OSHA. It is intended to assist in educating safety representatives and employees concerning hazardous substances, and provide guidance in implementing facility-specific Hazard Communication Programs. Each facility which deals with hazardous substances must have a Hazard Communication Program conforming to these general guidelines. Following the Introduction is the section which includes the hazard communication safety regulations for use throughout the City, and in facilities without a facility-specific program.

The basic goal of a hazard communication program is to provide information to City employees about the chemical hazards they work with and how to protect themselves. This knowledge should help to reduce the incidence of chemical source illnesses and injuries.

About 32 million workers are potentially exposed to one or more chemical hazards. Chemical exposure may cause or contribute to many serious health effects. Also, chemicals may also present safety hazards and have the potential to cause fires, explosions and other serious accidents. Due to these hazards the Occupational Safety and Health Administration (OSHA) issued a rule in 1983 called Hazard Communication. The scope of this rule was expanded in 1987 to include employers in the non-manufacturing sector. To underscore the pertinence of Hazard Communication for municipalities, a partial list of hazardous chemicals often associated with municipal operations include:

Formaldehyde	Sulphur	Freon
Hydrochloric acid	Lead	Hydrogen sulfide
Nitric acid	Hydrazine	Nitrous oxides
Sulfuric acid	Ammonia	Asphalt
Stoddard	Ethylene glycol	Mineral Spirits
Solvent	Phenol	Portland cement
Mercury	Ethyl acetate	Sulphur Dioxide
Sodium	Pesticides	Ferrous Sulfide
hydroxide	Crystalline Chlorine	Silica
Acetone	Carbon monoxide	Ferric Chloride
Toluene	Asbestos	

Please note that the above is only a partial listing.

Given that Cities such as Gunnison have exposure to these or other hazardous chemicals, it is prudent for all facilities using chemicals to have a program based on the Hazard Communication rule CFR 1910.1200. The following outlines the requirements of such a program and explains the various elements.

There are five basic requirements under the OSHA Hazard Communication Standard:

1. A written plan must be established explaining how the Hazard Communication Program works for the facility and who is responsible for various items in the implementation of the program.
2. An inventory of on-site chemicals must be assembled on a list that identifies each one of them consistently with the label.
3. A procedure must be developed for inspecting, creating, and maintaining container labels.
4. Material Safety Data Sheets (MSDS) must be collected for all products containing more than one percent of a hazardous chemical. These sheets must be accessible to employees, contractors and medical personnel.
5. Employees must be trained regarding the possible chemical hazards specific to their worksite. This training should also include procedures for safe handling of chemicals and protective devices that should be worn to limit exposure in the event of a spill or release.

The Hazard Communication Standard requires a written program, whether or not the City introduced the hazard in the workplace. The written program must address the following items:

Labeling

1. The designation of the person(s) responsible for ensuring labeling of containers within the facility.
2. Designation of person(s) responsible for ensuring labeling on shipped containers. For the City, this responsibility generally relates to DOT regulations with regard to hazardous waste which is not a part of the Hazard Communication Standard. The City seldom ships hazardous products that are not in the form of waste.
3. Description of the labeling system used.
4. Description of written alternatives to labeling of facility containers, where applicable.
5. Procedures to review and update label information when necessary.

Material Safety Data Sheets (MSDS)

1. Designation of person responsible for obtaining/maintaining the MSDS.
2. How such sheets are to be maintained (e.g., in notebooks in the work area, via a computer terminal, in a pick-up truck at the jobsite, via telefax) and how employees obtain access to them.
3. Procedures to follow when the MSDS is not received at the time of the first shipment from the supplier.

Training

1. Designation of the person(s) responsible for conducting training.
2. Format of the program to be used (audiovisuals, classroom instruction, etc.).
3. Elements of the training program - (discussed in the following).
4. Procedures to train new employees at the time of their initial assignment and when a new hazard is introduced into the workplace.
5. Procedures to train employees of new hazards they may be exposed to when working on or near another employer's worksite (i.e., hazards introduced by other employees).

Other Items of Discussion

1. Does a list of the hazardous chemicals exist, and if so, is it compiled for each work area or for the entire worksite and kept in a central location?
2. Are methods the employer will use to inform employees of the hazards on non-routine tasks outlined?
3. Are employees informed of the hazards associated with chemicals contained in unlabeled pipes in their work areas?
4. Does the plan include the methods the employer will use at multi-employer worksites to inform other employers of any precautionary measures that need to be taken to protect their employees?
5. For multi-employer workplaces, are the methods the employer will use to inform the other employer(s) of the labeling system used described?
6. Is the written program made available to employees?

The Chemical Inventory

An inventory of the hazardous chemicals present at the facility should be assembled. It is prudent to keep this list near the front of every book of MSDS with product names as they appear on the MSDS. This can be used as a cross reference which allows the user of a chemical to readily find needed information.

A hazardous chemical is any chemical that presents a physical and/or health hazard as shown by at least one study where the hazard was recognized at a level showing statistical significance. If OSHA has published a Permissible Exposure Limit (PEL), or the American Conference of Governmental Industrial Hygienists (ACGIH) has established a Threshold Limit Value (TLV) for the chemical, the chemical is automatically deemed hazardous. With the exception of highly toxic or cancer-causing chemicals, all chemicals present in quantities greater than one percent in a product must be listed in the inventory. Chemicals that are more toxic (e.g., benzene) must be listed if in a product at greater than 0.1 percent.

The chemical inventory should include the manufacturer's product name, location, and telephone number; and the work area where the product is used. Hazardous chemicals that may be generated in the work operation by the municipality must also be listed (e.g., welding fumes). After the inventory is assembled, a central coordinating department such as purchasing, should be consulted to determine whether all hazardous chemicals purchased are on the list. A procedure should be developed to keep the list current when new substances are purchased and used. It is very helpful to use the purchasing department to approve all purchases of hazardous chemicals and track the inventory in a data base. If any product containing a hazardous chemical is used in greater frequency or quantity than typical consumer use, the product or chemical should be included on the chemical inventory.

A helpful way to organize the chemical inventory is to separate the chemicals and/or products into various classifications (e.g., flammable, highly toxic, carcinogenic, etc.). The National Fire Protection Association (NFPA) has a system that classifies chemicals having acute effects into certain groups in accordance with similar characteristics. These classifications are helpful to train workers on the types of hazards in the workplace. However, the classifications are based on how the chemicals react in the event of a fire. This may or may not be indicative of how the chemicals behave at room

temperature. Until a standardized labeling and classification system is developed, a combination of communication measures may be appropriate.

Labeling

The standard requires that any container, bag, barrel, box, bottle, etc. be labeled if it contains hazardous materials and is not used merely by one person during one work shift. Given these criteria, a pail or beaker of hazardous material must be labeled if used to transfer material from a larger receptacle such as a 55 gallon drum. The labels on both the larger receptacle and the container used for transfer must have the same information. The chemical or trade name and the labels should be the same as that on the Material Safety Data Sheet.

Labels must include the following:

1. The chemical or mixture's trade name.
2. The name and address of the manufacturer.
3. A warning with regard to the potential health effect or hazard - NFPA labels can be used for this in most cases.
Optional information - seen as helpful
4. The Personal Protective Equipment (PPE) appropriately worn during the product's use.
5. The organ(s) affected by exposure to the chemical or mixture (e.g., blood, liver, kidneys, etc.) This is referred to as the target organ.

Material Safety Data Sheets

If a product is purchased containing more than one percent of a hazardous chemical, an MSDS should accompany the shipment of the product. If an MSDS is not attached, a system to ensure that the appropriate MSDS is received should be put in place. The purchasing department also has the option to implement a policy which will refuse all shipments of hazardous materials not accompanied by an MSDS. Hazardous products bought at the hardware store that are used with greater frequency or amounts than typical consumer use must also have an MSDS. However, these items will not typically be bought with an MSDS. Therefore, the hardware store should be contacted to determine the supplier who sold the product. This supplier should then send an MSDS upon request.

After obtaining the MSDS, the data sheet should be checked to determine whether all the necessary items are included. The following is a list of required items:

1. Product or chemical identity used on the label.
2. Manufacturer's name and address.
3. Chemical and common names of each hazardous ingredient (including CAS numbers).
4. Name, address, and phone number for hazard and emergency information.
5. Preparation or revision date of the MSDS.
6. The hazardous chemical's physical and chemical characteristics, such as vapor pressure and flashpoint.
7. Physical hazards, including the potential for fire, explosion, and reactivity.
8. Known health hazards (including signs and symptoms of exposure or any medical conditions aggravated).
9. OSHA Permissible Exposure Limit (PEL), ACGIH Threshold Limit Value (TLV), or other exposure limits.

10. Emergency and first aid procedures.
11. Whether OSHA, NTP or IARC lists the ingredient as a carcinogen.
12. Precautions for safe handling and use.
13. Control measures such as engineering controls, work practices, hygienic practices or personal protective equipment required.
14. Primary routes of entry.
15. Procedures for spills, leaks, and clean-up.

One quick way to check the MSDS is to see if all blocks/spaces are filled out as is required by the standard. The MSDS can be in any format as long as it has the above information. If the MSDS does not give adequate information, it may be best to contact the supplier for a more complete MSDS or to send the product back and refuse to use that vendor unless an adequate MSDS can be obtained.

The MSDS must be available to employees, their designated representatives, emergency personnel such as fire departments, and to appropriate government agencies.

The purpose of the MSDS is to communicate the chemical hazards, safe handling and emergency procedures, and contact information for further assistance if needed; for routine use as well as emergencies.

All the chemical ingredients of the product will be listed if in a percentage greater than one percent. Many times, manufacturers and suppliers will not disclose the ingredient for proprietary reasons. This is permissible for ingredients that are not considered hazardous.

The Chemical Abstract System (CAS) number which is a unique number assigned to each chemical, should be included on the MSDS next to that chemical. The CAS number relates to a chemical registry which allows one to find a particular chemical and information regarding it in a computer data base. Chemicals can be known under a number of different synonyms so the number is assigned to assure the chemical's accurate identity.

Some products during normal use or during heating may give off hazardous by-products even though they may not be hazardous in their original form. This information is important to protect against potential hazardous exposures. Any material which may emit hazardous components when being formed, welded, sawed, etc. must have an MSDS. For example, bricks may require an MSDS if the bricks are sawed and present an exposure to silica dust (sand).

Interpretation of the Standard Regarding MSDS

MSDS must be written in English, but can be translated into other languages for the purposes of training.

Hazardous chemicals need not be reported on the MSDS if it can be demonstrated that the hazardous components are bound in such a way that there is no potential for exposure to it. The standard defines exposure as potential as well as measurable exposure by any route of entry, either under normal conditions of use or in a foreseeable emergency. If there is no potential exposure given this definition, the chemical is not covered under the standard.

Computer generated MSDS do not have to include fields which do not apply to the chemicals for which it is being used. In "standardized" forms where the information does not apply, this should be noted appropriately (e.g., N/A).

Where evidence indicates that a class or family of chemicals presents similar health hazards, it is appropriate to report those findings on the MSDS with respect to the entire class or family. NFPA classes of chemicals can be used in such a way.

The standard requires readable MSDS or electronically accessible MSDS to be maintained on site. This may be accomplished by the use of computers with printers, microfiche machines, and/or fax machines. The key issue in compliance is that no barriers to access needed information exist during the work shift. For highly toxic chemicals, it may be helpful to have MSDS (available within 15 minutes) at each job site. For less hazardous chemicals, accessibility during the work shift is appropriate.

Communication of the hazard information via telephone does not satisfy the requirements of the standard. However, if employees are working at remote stations, (trucks, construction trailers, etc.), vital information related to an emergency can be communicated via telephone, CB radio, etc. with subsequent sending of hard copy MSDS via mail, fax or delivery. In this scenario, person must be stationed whenever appropriate at the central location to disseminate information to those at remote locations.

A system for retrieval of MSDS should not require that a supervisor be contacted. The locations where the MSDS books or computer terminals having the same information are kept should not be locked up preventing access. If computers or telefax systems are used exclusively to communicate hazard information, all employees must be trained on their proper use. On multi-employer jobsites with contractors, municipalities must provide contract personnel foremen/supervisors with MSDS of products or chemicals that they may contact either routinely or in a foreseeable emergency in the scope of their work. If the contract employer(s) bring hazards to the municipality's worksite, they must submit MSDS to the appropriate city personnel and any other contractor's foreman if exposure is possible for other's employees.

Arrangement of MSDS Books

Although there is no prescribed system for arranging the MSDS books, some suggestions are appropriate:

1. A comprehensive book having all the MSDS will be kept in one department such as Purchasing. This book shall be updated by one person. Copies of the new/revised MSDS should then be sent to the departments that are using that product or chemical. This is one reason why purchasing or a central coordinator must be advised of any new hazardous chemical which enters the system.
2. Books for MSDS of chemicals/products that are used at a particular worksite should be kept within that worksite. These smaller MSDS books will more readily allow an employee to find the MSDS of concern.
3. A chemical inventory for that particular department should be kept at the front of each MSDS book, with an exhaustive inventory kept in the book discussed in suggestion (1).
4. The books should be divided in a logical manner. One way to separate the books is by class of chemical (e.g., acids, bases, flammables, carcinogens). Another way to separate the book is by type of use (e.g., lubricants, cleaning products, compressed gases, welding products, adhesives, paints). After these divisions are made, it is most helpful to compile the products/chemicals alphabetically by trade name.
5. After organizing the book, it is helpful to use the chemical inventory as an index, noting the page number or section that the MSDS for the chemical resides.

There should be some method to update the index as new MSDS are placed in the book.

6. It is highly recommended that the Hazcom Written Program be placed near the front of each MSDS book.
7. The MSDS books at each location must be periodically updated by a designated person.

City-Wide Hazard Communication Regulations

1. Review the Hazard Communication Program of the department or facility before working with any chemicals. Check material safety data sheets of chemicals prior to use.
2. Wear appropriate personal protective equipment as recommended by material safety data sheets when working with chemicals.
3. All personnel working with chemicals shall be adequately trained in potential hazards of the chemicals they are using.
4. Report all injuries or accidents immediately.
5. Clean up all minor spills.
6. Evacuate and cordon off the area, call 911, and contact your supervisor if a major spill of hazardous materials should result. DO NOT attempt to clean up a hazardous materials spill alone.
7. Properly store chemicals in such a way that chemical incidents do not result.
8. Properly label all containers containing flammable, poisonous, toxic, or otherwise dangerous materials.
9. Store insecticides, pesticides, herbicides, flammables, and strong acids in storage that is locked from public access.
10. Post signs informing personnel that hazardous chemicals are located in cabinets, lockers, closets, etc.
11. Employees required to wear respiratory equipment must be qualified to do so. This includes but is not limited to training, medical qualifications, and fit testing of respirators.
12. Only approved solvents will be used to clean parts and materials.
13. Gasoline, kerosene and other potentially dangerous materials will not be used as cleaning solvents.
14. Employees shall wear as a minimum gloves and goggles when working with cleaning solvents.
15. Maintain adequate ventilation when working with chemicals.
16. Employees should know the location of the nearest fire extinguisher, first aid kit, emergency eyewash, emergency shower and telephone when working with chemicals.

HEARING CONSERVATION PROGRAM

1. Check to see if elevated noise levels are present, and as appropriate, review the Hearing Conservation Program of a department or facility before working in those areas.
2. Certain areas may be identified as "High Noise Areas". Personnel working in these areas will wear approved hearing protection.
3. When requested by supervisors, employees shall wear approved hearing protectors even if the area is not marked. Employees who are concerned about noise levels should request hearing protection be provided.

4. Personnel will be adequately trained in the use of hearing protection and will be familiar with the hazards related to elevated noise levels.
5. Hearing protection will be made available to anyone working in areas where elevated noise levels exist.
6. Personnel routinely exposed to elevated noise levels above 85 decibels shall be included in a Hearing Conservation Program. Contact your supervisor if you have questions regarding such a program.
7. Remember- people do not get accustomed to loud noises -
THEY LOSE THEIR HEARING!

OCCUPATIONAL HEALTH AND SAFETY

1. The following health hazards may exist in various Gunnison facilities and/or locations.
 - A. Asbestos
 - B. Noise
 - C. Respirable Dust
 - D. Silica
 - E. Welding fumes
 - F. Chlorine
 - G. Flammable products
 - H. Hazardous chemicals
2. Employees will be made aware of any potential hazards before work begins.
3. Noise signs shall be posted in areas where hearing protection is required.
4. Respirators will be used in areas where the presence of respirable dust, silica, hazardous chemicals may exist.
5. Welders will be adequately trained in the risks associated with welding fumes.
6. Adequate ventilation will be provided during welding operations.
7. Inspect the work area for the presence of flammable materials before the work begins. Locate the nearest fire extinguisher.
8. Report all accidents and/or injuries to your supervisor as soon as possible.

MAINTENANCE SHOP SAFETY

Maintenance shop personnel, in addition to the areas outlined below, should pay particular attention to Safety Manual sections on Welding Cutting & Brazing, Cranes & Hoists, Power and Hand Tools, and Lock, Tag & Try procedures.

Garage Operation

1. Remove all jewelry from your body before beginning your shift.
2. Do not run a vehicle inside the shop without hooking up the exhaust ventilation system, or without assuring adequate shop ventilation.
3. Always inflate multi-piece truck tires in a safety cage to protect yourself from flying lock rings (refer to multi-piece training material). Before inflating multi-piece truck tires, employees shall be trained on multi-piece rims.
4. Do not remove radiator caps until the engine has cooled and pressure in the hoses eliminated.
5. Always support a vehicle with support stands of the proper capacity after using a hydraulic jack.
6. Never remove dust from brake drums and clutch areas with compressed air.
7. Do not exceed recommended p.s.i. when cutting or welding with oxygen-acetylene.

8. Do not weld on fuel tanks before removal and complete purging with nitrogen. (see Rule 1.28)
9. Clean all spills immediately to prevent slipping hazards.
10. Do not disable solvent tank safety links. They must be kept in working order.
11. All protective equipment must be worn as required. Face shields, gloves, welding helmet, etc.
12. Use the proper tool for the job at hand and keep tools in good repair.
13. All brake, steering and suspension work must be double checked. Road test if necessary.
14. All employees are responsible for housekeeping in their work area.

Radiator Service

1. Care must be taken when checking the radiator since automotive cooling systems work under pressure. The coolant may be in the boiling range and therefore too hot to check safely. Always observe the following precautions when checking the radiator.

Place wiping cloth over cap and turn it 1/4 turn counter-clockwise. This will permit the escape of pressure.

Caution: If a rumbling noise is heard coming from the radiator, or if coolant spews out from under the cap, close the cap immediately because the coolant is too hot and will boil over violently if pressure is released. The coolant will have to cool down before it can be checked safely.

Remove the cap by turning it counter-clockwise until stop is reached, and then lift it off.

Operate the engine at idle speed when adding water or anti-freeze while the engine is hot. This will allow it to circulate quickly without damage to the engine block. If water is very low or engine is extremely hot, wait for it to cool before adding coolant.

Tire Service

1. Check pressure and inspect tires before inflating them.
2. Protect yourself against blowout when inflating tires. Never squat facing the tire, stand at one side so that the fender is between you and the tire, if possible. Use chuck gauge with clip and extension hose.
3. Never leave jack handles or other tools where they can be a tripping hazard.
4. A protective cage or equivalent protection shall be provided for the inflating of truck tires.

Battery Service

1. Do not smoke or permit open flames or sparks near batteries that are being recharged as they emit hydrogen gas, which is explosive. Recharge batteries only in a well ventilated area.
2. When disconnecting a battery always remove the ground cable first in order to prevent sparks if the wrench is accidentally grounded.
3. When installing a battery always attach the ground cable last.

4. Wash acid and corroded particles from hands immediately after performing battery service. Be sure that clothing is free of acid and corroded particles.
5. Face shields or other eye protection shall be worn when handling batteries. If acid gets into the eye, promptly rinse the eye thoroughly with water until chemical is completely removed. After a thorough rinsing, cover the eye with a sterile gauze compress and take the injured person to a doctor.
6. Use great care in the storing and handling of electrolyte for dry charge batteries.
7. Follow safe lifting practices when handling batteries. Use only an approved carrier. When lifting batteries in and out of under hood mountings, you can sometimes gain additional leverage by resting your elbows on the fenders.

Lubrication and Maintenance Service

1. To prevent slipping, promptly clean up oil and grease from floors. Never discharge a high pressure grease gun at any part of the body, as grease may penetrate the skin, causing injury.
2. Do not rock cars while they are on a twin post or free wheel lift, as movement may cause enough shifting of the car on the supports to fall off the lift.
3. Do not stand in front of a vehicle when guiding onto a lift or pit. If you do, you may be injured if it does not stop in time.
4. When using floor lift jacks, be sure they are resting on a firm base and made good contact with the car. When chain hoists or jacks are used, vehicles shall be securely blocked before employees go under them.
5. Do not allow anyone to remain in a vehicle being raised on a lift.
6. Do not overload the lift.
7. Keep your hand on the control valve when the lift is being raised or lowered. Do not prop it open.
8. Do not allow anyone to walk under the lift when it is being raised or lowered.
9. Report immediately to your supervisor any faulty operation of the lift. Do not use the lift until the defect has been corrected. A jumpy lift usually means low oil -- have it filled or repaired. Tag lift until repaired to warn others.
10. When using the lift, observe the following precautions:
 - A. Center the vehicle over the lift.
 - B. Adjust the adapters to make proper contact with the vehicle.
 - C. Raise the lift slightly off the floor almost making contact with the vehicle.
 - D. Look under the vehicle, making sure that the gas line, muffler, tail pipe, or other parts of the car will not be damaged by contact with the lift.
 - E. Raise the lift until contact is made and vehicle begins to rise slightly.
 - F. Look under the vehicle, checking that proper contact is being made, and if satisfactory, continue raising the lift to the proper height.
 - G. When fully raised, inspect contact points to make certain that the vehicle is firmly positioned.
 - H. Do not open the doors of vehicle that is raised on a frame contact lift.
 - I. After lowering, check to insure that there is adequate clearance under the vehicle before moving it off the lift.
 - J. When not in use, the lift shall be lowered completely to avoid accidents.
 - K. Lift areas shall be cleared of objects from prior jobs. Oil absorbent material shall be used to remove excess oil and grease before a new job is started.
11. Vehicles shall be properly positioned and automatic chocks shall be operative on all lifts.
12. Safety legs or pins shall be operative to prevent dropping of lifts in event of pressure failure.
13. Do not work under vehicles or other equipment supported by jacks or chain hoists without protective blocking or stands that will prevent injury if jacks or hoists should fail.
14. Hoods, dump sections of dump trucks and similar movable parts shall be blocked to keep them stationary during repairs. (See Lock Tag & Try section of Safety Manual.)

Air Compressors

1. Turn off the main switch before oiling, wiping, or working on the air compressor.
2. Test safety valve weekly to be sure that it operates properly.
3. Never tamper with the safety valve or controls. All adjustments and repairs should be made by qualified mechanics.
4. Do not pile objects near the compressor, nor hang them above it in such a way that they could fall into the mechanism.

Special Fire Prevention - Protection

1. No petroleum products or solutions containing petroleum shall be poured into any drain or sewer.
2. Never use gasoline for cleaning purposes under any circumstances.
3. Put all oily waste in covered metal containers. Approved and properly marked storage containers shall be provided for waste, oily rags, etc. Empty them frequently to prevent spontaneous combustion.
4. Welding and brazing shall be done away from flammable or explosive substances. Appropriate fire extinguisher shall be located nearby.
5. Smoking shall not be permitted in any maintenance shop area in the vicinity of flammables.
6. The correct type, proper size and adequate number of clearly marked and easily accessible extinguisher shall be provided.
7. Fire exits shall be properly marked and kept clear at all times. During working hours all exit doors must be kept unlocked.
8. Employees shall be instructed in the safe handling of flammables. (See Hazard Communication Section)
9. Only approved and properly marked cans shall be used for flammable liquids.
10. Fire authorities should be given information about the premises to enable them to respond to an emergency.
11. Employees shall be instructed in evacuation procedures.

What to Do In Case of Fire

1. Know the location of fire fighting equipment and how to use it.
2. Know how to contact the Fire Department. Keep the telephone number in a prominent place.
3. When a fire starts, lose no time in using fire fighting equipment at hand, and try to control the fire before it spreads. Call, or have someone call the Fire Department.
4. When a gasoline spill catches fire, attack the flame at its base. When using a dry chemical or carbon dioxide extinguisher, use a rapid side-to-side motion. Be sure that all of the fire is put out or it will reflash.
5. Notify your supervisor and the Risk Manager as soon as possible after a fire has occurred.

Fire Extinguisher Equipment

1. Put extinguisher in convenient places. Permit nothing to be in front of or on the extinguisher.
2. Check extinguisher periodically to make sure they are filled and in good working order. Inspection date and signature of inspector must be on tag attached to the extinguisher.

3. Check extinguisher nozzle often to make sure they are clean and ready for use.
4. Have extinguisher recharged immediately after use.

Closing of Vehicular Service Building

1. Turn off air compressor at main control switch and air valves at the tanks.
2. Check control setting of heating equipment, and be sure it is working properly.
3. Lock all windows and doors.
4. Disconnect all coffee makers and appliances except refrigerators.

FUEL DISPENSING SAFETY

General

1. Good housekeeping shall be maintained in the entire service area.
2. Gasoline dispensing pumps shall be properly labeled.
3. Should a fire occur at the unit while the nozzle is still in the tank, shut off the pump. Do not remove the nozzle until the fire has been put out.
4. Report unsafe gasoline nozzle i.e. faulty automatic shut-off.
5. Smoking is not permitted in any fuel dispensing area.
6. Stand in a safe position at the pump. Do not cross in front of moving vehicles.
7. Before delivering gasoline into the fuel tank make certain the engine is off.
8. Good metallic contact shall be made between the nozzle and tank before filling the tank. Use particular care when topping off, so as to avoid spillage of gasoline.
9. Always replace fuel tank cap immediately after delivery.
10. Be sure hose nozzle is hung securely on the pump after delivery.
11. Keep pump hose exactly placed within island limits so it will not catch on bumpers or fenders.
12. Keep hose, nozzles, and connections in good condition.
13. Report immediately any leakage near the gasoline pump. Do not use the pump until the leak is fixed. This work shall be done only by a qualified mechanic.
14. Fuel spillage on driveways should be reported immediately. If the spill is large enough to create a risk of the fuel reaching drains immediate measures should be taken to stop the flow of the fuel. Dumping sand on and in the way of the flow is recommended.
15. Remove clothing wet with gasoline immediately and be sure that it is cleaned before it is worn again. Do not go near a heater or open flame wearing gasoline soaked clothing. When the skin has been wet with gasoline, wash the affected part thoroughly with soap and water to prevent skin inflammation.
16. Deliver gasoline into fuel tanks of properly labeled metal containers only. Never deliver gasoline into glass bottles, open containers, or food, drug, or cosmetic containers. The Federal Hazardous Substances Labeling Act requires that any container that is filled with gasoline, kerosene or other hazardous substances must be labeled in an approved manner. (In private service stations, if the container does not have such a label, the dealer must apply one before filling it.)
17. Employees shall not siphon gas with a hose or tube, particularly where the mouth is used to create suction.
18. The location of shut-off switch should be clearly marked, and all employees should know where it is and how to use it.

Automatic Nozzles

1. Use only automatic nozzles which have been approved by Underwriters Laboratories, Inc. and the City Fire Department.
2. In situations where the nozzle cannot be secured to prevent it from falling out, remain by the nozzle and fill the tank on manual control.
3. Observe the nozzle frequently while gasoline is being delivered so any mechanical failure will be noticed immediately.
4. Check the automatic nozzle regularly and keep it in good repair.

Receiving and Storing Gasoline

1. Fill pipes of underground tanks shall be plainly marked by color code, tags, or other methods on the installation to show the contents of the tank. Always take precautions to prevent the mixing of products as a result of delivery into the wrong tank.
2. Keep fill caps tight between deliveries to keep water or dirt from entering. The use of grease on threads will aid in keeping fill caps watertight.
3. Gauge tanks with calibrated sticks in gallons or inches, before ordering, and again before receiving deliveries to be sure the quantity being delivered will not overflow. Be sure also that the correct tank chart is used.
4. Clear fill pipe areas of parked cars prior to the time of delivery of gasoline. Do not allow parking in those areas where it will interfere with absentee deliveries. A car parked near or over a fill pipe may be a serious fire hazard.
5. Make sure that gasoline vapor discharged from vent pipes does not enter buildings. Do not strike matches or permit other sources of ignition near vent openings. (It is especially important when tanks are being filled because an equal volume of flammable vapor is being discharged into the air through the vents).
6. Report to the immediate supervisor on duty at once if liquid gasoline should discharge from vents at any time.

REFUSE COLLECTION

General

1. Drive your vehicle on the right hand side of street unless operating on one-way streets or specifically directed otherwise by supervisor.
2. Never activate packing mechanism on rear loaders unless turn-buckles are properly fastened, except when unloading packer.
3. Collection crews shall haul only the type of refuse they have been assigned.
4. Crew members shall handle refuse in such a manner as not to increase the hazard to themselves from broken or flying glass.
5. Never manipulate anything in or near the hopper while packer is in operation.
6. Do not manually push refuse into hopper while packer is in motion.
7. Never put any part of your body in the hopper area while the packer blade is in motion.
8. Never activate packing controls while any portion of the body is in the hopper area.
9. Make sure there are no objects on the edge of the hopper, such as lumber or pieces of glass, which would fly out and injure someone when packer is in motion.
10. No one will ride in the hopper. Ride only in prescribed locations. At no time shall any part of the body extend into the hopper.
11. Never put refuse in hopper when truck is full.

12. Use caution when moving heavy wheeled containers.
13. Each rear load truck should carry a broom and shovel to clean up rubbish spills.
14. Containers used in carry out service, when left unattended, should be out of driveways and walkways, off sidewalks, and near curb.

Unloading Operations

1. All refuse collected shall be delivered to the designated disposal point where the complete load must be discharged.
2. Directions of disposal site attendants shall be followed except when they would result in personal injury or damage to the vehicle.
3. Be alert at the disposal site and watch out for sharp objects and wire that may puncture tires or tangle drive line.
4. Wait until vehicle is completely stopped at the disposal area before unfastening turnbuckles or latches.
5. Use caution when opening manually operated rear doors on trucks.
6. Employees, not operating the dumping controls shall stand clear of the vehicle until the load is completely discharged.
7. Never raise the tail gate or operate the push plate in a jerking manner.
8. When tailgate is in raised position, never have any part of body between vehicle body and raised tailgate unless proper blockage is installed.
9. Stop all engines and remove the key before getting into the packer body to clean it.
10. While at the disposal site, the area in front of push-out type packer blades shall be cleaned of refuse.
11. Drivers of refuse collection vehicles shall inspect their vehicles for cracks, broken welds, etc., while at the disposal site.
12. Employees shall not remain at the disposal site any longer than necessary.

Hazardous Materials

If refuse personnel come in contact with or identify suspected hazardous material, radio supervisor, City shops or 911. Advise them of your location and situation. If possible, do not touch, handle or remove the material from the original location where it was found.

Vehicle Breakdowns

1. Call your supervisor or City Shops to report breakdown. Give truck number, location and description of trouble.
2. If vehicle stalls on roadway, warning triangles (reflectors) are to be placed in a manner conforming to D.O.T. vehicle code.
3. Stalled vehicles are not to be left unattended.

Injuries

1. Report all injuries, regardless of how minor, on the same day they occur.
2. Any serious injury shall be reported to supervisor immediately.
3. Any employee, witnessing an accident, shall immediately assist the injured and arrange for medical treatment if required.
4. In the event a man is caught in hopper or packer: Stop operation of vehicle packer immediately. Check extent of injury. If help cannot be administered, summon help.
5. Approved forms shall be made out for all personal injuries.

Vehicle Fires

1. For fires in the packer body of the truck, radio your supervisor, City shops or 911. Advise them of the fire and location of truck. Attempt to locate an isolated but accessible area to dump the load. Move truck away from burning refuse pile, and maintain radio contact if possible.
2. For fires in the engine or cab compartments, radio supervisor, City Shops, or 911. Advise them of the fire and location of the truck. Move truck away from any structures. Attempt to put out the fire with the fire extinguisher, if possible to do so without endangering yourself. Maintain radio contact if possible.

TREE TRIMMING OPERATIONS

Tools and Equipment

1. All tools and equipment shall be properly maintained.
2. Employees shall make daily inspections of all equipment, tools, etc. before using them.
3. Hand saws shall be kept sharp and properly set so they will not jump out of the cut and cause injury.
4. Ramp boards (used to load equipment into trucks) shall be kept smooth sanded and varnished to prevent splintering of boards. (Hinged ramps are recommended.)
5. Proper care of safety lines shall be taken at all times. Safety line shall be protected against wetting or dampness. Should it become wet, dry completely before storing. Safety lines and hand lines shall be kept in a clean box by themselves. Do not store lines and tools together. All ropes and lines shall be kept coiled when not in use and hung in a clean, dry, dark, well ventilated area.

6. Chipper blades shall be kept sharp. (Dull blades cause extra strain on the engine and may cause chippings to clog in the chute).
7. Do not store pop bottles or other items in tool boxes or in the drivers compartment.

Fuels

1. Fuels shall be dispensed and stored safely.
2. Stop gasoline powered equipment before fueling and wipe away spills before starting it.
3. Fuels shall be stored in approved flammable liquid containers only.
4. Fuel containers shall never be stored or carried in crew compartments.

Personal Protective Equipment

1. Appropriate personal protective equipment shall be used and properly maintained.
2. Safety goggles or face shield and hearing protection shall be worn when feeding a chipper.
3. Work gloves shall be worn when roping, handling equipment and tools.
4. Shoes should have high tops with non-slip soles.
5. Safety equipment such as goggles, hard hats and gloves should be stored where it is readily available. Goggles and face shields should be kept clean, and should be replaced when cloudy or scratched.
6. All personal protective equipment should be clean and sanitary.
7. First aid kits shall be carried on all trucks and kept well supplied.

Work Area Protection

1. Traffic cones, barricades, high level warning devices, etc., shall be properly placed in the street after the truck stops at the work location. Flashing warning signals should be observed for a few minutes to assure they are working correctly. (See section on barricades and work area protection for further guidance.)

Tree Trimming Operation - General Rules

1. Safe procedures shall be observed when climbing and working trees. Never use bull rope for climbing.
2. A climber should be above the limb he is cutting off to prevent being struck by it.
3. All limbs shall be tested before the full weight of the body is allowed to rest on them. Keep one arm around the trunk or keep the hands on separate limbs.
NOTE: Branches are more apt to snap off on a cold day than on a warm day.
4. Only one man shall work in a tree at a time unless an additional person can work in the same tree safely.
5. Trees shall not be climbed or worked in when wet unless in an emergency.
NOTE: Use extreme caution when doing so.
6. Climbers shall keep hands and feet out of tight crotches of limbs which may wedge them in.
7. Safety lines shall be used when climbing as well as in performance of work. Use safety line with a saddle and have the climber assisted up the tree by groundmen when necessary.
8. The climber shall tie himself in with his safety tag-line while changing his safety line or re-crotching.
9. Knots tied to lines for prolonged periods or knots tied repeatedly at the same point in a line will cause kinking and excessive wear. Avoid this practice.

10. The safety line should be crotched around the main trunk and only at a height that the trunk would support the climber's weight.
11. Safety lines shall be examined for cuts and wear and tested before each day's use. Questionable lines shall be taken out of service at once.
12. Safety lines shall be at least 1/2" 3-strand esterion, safety blue, polyester or nylon and from 120-150 feet in length when used in larger trees.
13. The working load of a line shall not exceed 1/5 the breaking strength of the line.
14. The climber should stay in his safety saddle until he is again safely on the ground.
15. When using a ladder, lashing or other tie lines should pass over side rails and the end of the rungs (not over the center of the rungs).
16. Ladders must be placed on sound footing (and not in the bed of a truck).
17. When using straight ladders at trees, to establish proper angle, the foot of the ladder should be moved out of the perpendicular by 1/4 the length of the ladder. If the ladder is 12 feet long, the foot should be 3 feet out from the base of the tree. Estimate the length of the ladder by counting rungs which are usually 1 foot apart.
18. Tools shall be raised or lowered by means of a hand line or the free end of the safety line.
19. Hand saws should be carried in a scabbard and securely fastened to the climber's belt.
20. Tree spurs shall be put on at the base of the tree and removed when reaching the ground.
21. A large tree limb that cannot be controlled by hand should have a line or lines attached for controlled lowering before the limb is cut off.
22. The trimmer shall place himself in the tree so that the saw cannot fall against him if it is suddenly released.
23. When using the chain saw from the bucket always have it attached by a safety line to the bucket.
24. Safety goggles or face shield and ear plugs or muffs shall be worn when operating chain saw.
25. Always give proper warning when about to drop something out of a tree, such as: "Timber"; "Heads up"; and "Look out below".
26. Not more than two men at a time should be allowed to work near the base of a tree which is being felled.
27. When trees must be cut flush to the ground, it is safest to make the first cut at stump height above the swell of the roots and cut the stump flush with the ground after the tree is down.
28. When felling trees on hillsides, try to drop the tree up the slope (and not downslope nor across the slope).
29. Make sure the area around you is clear before turning to the side with a chain running in your hands.
30. Never leave a saw or any other machine running unattended.
31. When bucking fallen logs on hillsides, wedge logs firmly first and then buck only from the high side.
32. Pruner poles must be made of non-conductive material and have a non-conductive pull line between the lever arm and the handle. This is a safeguard against electrical shock.

33. Only one person shall feed a chipper at a time. If other employees are available - they should prepare the bush for the person feeding the chipper. Stand to the side when feeding the chipper.
34. Safety goggles or a face shield and hearing protection shall be worn when feeding the chipper. No loose clothing or gloves with holes shall be worn when chipping or stump grinding.
35. The bush shall be cut small enough so that, if it is drawn into the chipper, it will not cause injury to the operator.
36. Under no circumstances shall tools such as scoops or forks be used to push brush and debris into the chipper. Such practice is extremely dangerous to the operator and the machine.
37. Pneumatic tools must be handled with care so that they will not be activated unexpectedly. Disconnect a pneumatic tool from the airhose before handing it to another person and before leaving it unattended.
38. When edging, a safety shield shall be worn by the operator to prevent rocks from striking him/her in the face. A face shield and shin guards shall always be worn when operating a lawn renovator.
39. To prevent head injuries, low hanging limbs shall be trimmed and hard hats shall be worn.
40. Safety goggles or a face shield shall be worn when operating the stump cutter.

RESPIRATORY PROTECTION PROGRAM

This program will provide the City of Gunnison employees with the means to properly select, use and maintain respiratory equipment. Each department will determine the specific need to use respiratory equipment and will ensure that their employees will meet all necessary requirements of the City of Gunnison Respirator Program.

It is the responsibility of the City to provide a safe and healthful workplace for it's' employees. In an effort to meet these requirements, all departments will conduct various surveys to determine whether the need for a Respiratory Protection Program exists. The employees who work in selected areas will be covered by this program. This program will dictate what steps must be taken to reduce employees to nuisance dust, respirable dust, toxic chemicals, etc.

The following employee job classifications will be covered by the Gunnison Respiratory Protection Program. These employees were selected based upon workplace observations, total dust, respirable dust, and other known workplace chemical evaluations. Covered employees will be evaluated annually.

The following job classifications have been identified:

1. Fire Department personnel
2. Parks and Recreation pesticide/herbicide applicators
3. Maintenance personnel who weld periodically
5. Maintenance personnel who paint periodically
6. Water treatment personnel working with chlorine.
7. Streets & Alleys personnel who operate the street sweeper.

Personal Protective Equipment

The selection of respirators is based upon several factors. These factors include but are not limited to workplace air contaminants, employee fit test results, employee comfort and ease of use in the workplace. Employees are fit tested using the "Rainbow Passage". This passage is discussed in Section X., Fit Testing Procedure and Results. It has been determined through site inspections and surveys that the primary type of respirator required is either Air-Purifying Respirators or Air Supplied Respirators.

Each department will list the types and models of respiratory equipment available at their respective facilities.

Respirator Care and Maintenance

Respirators containing filters will be changed on a daily or shift basis. Employees will be furnished these types of respirators if they desire. These employees will be responsible for the care and maintenance of these respirators. Employees using respirators will use the following procedure to adequately clean their respirators.

1. Remove used or spent filter.
2. Examine all parts of the respirator (i.e. straps, inhalation valve, exhalation valve, etc.)
3. Wash the entire respirator in warm soapy water. The use of a mild disinfectant is recommended.
4. Shake or gently wipe all excess water from the respirator. Allow the respirator to air dry.
5. Re-examine the respirator when installing the new cartridges.
6. Report any damage or defects to your immediate Supervisor.
7. Do not make repairs on respirators.

Additional respirators will be available upon request. These respirators will be inspected monthly. These respirators will be stored in clean, dry locations. These respirators will be stored in their original containers or clean containers. Disposable dust respirators will be discarded at the end of the day or sooner if necessary.

Supervisors will periodically inspect the condition of respirators.

Air supplied respirators will be inspected periodically by qualified individuals. The air used in these systems shall meet "Grade D" specifications. Compressors used to fill tanks will be tested every six (6) months. Guidelines developed by the Compressed Gas Association for "Grade D" specified air shall be met.

Employee Training

City of Gunnison employees will be adequately trained in the use of Air-Purifying Respirators or Air-Supplied Respirators. These employees will be trained in all aspects of these respirators. During this training session employees will also be fitted with an approved respirator. Records of employee training will be kept by the Town of Carbondale Department where respirators are utilized.

A training outline used to discuss Respirators is given below that may be used as a suggested guideline for air purifying and air supplied respirators. It is strongly recommended that a training outline be prepared that is specific for each respective department.

I. INTRODUCTION

- A. Uses
- B. Advantages
- C. Disadvantages
- D. Limitations
- E. Fit Testing
- F. OSHA Eleven Point Program
- G. Employee Qualitative Fit Test

II. TYPES OF RESPIRATORS

- A. Dust
- B. Mist
- C. Fume
- D. Organic Vapor
- E. Supplied air

III. APPLICATION

- A. Nuisance Dust
- B. Total Dust
- C. Respirable Dust
- D. Silica
- E. Welding Fumes
- F. Degreasing vapors
- G. Acids/Bases
- H. Toxic chemicals

IV. ADVANTAGES

V. DISADVANTAGES

VI. LIMITATIONS

- A. Air purifying
- B. Air supplied

VII. FIT TESTING A. Negative Test B. Positive Test C. Banana Oil Test D. Irritant Smoke Test

VIII. OSHA ELEVEN POINT PROGRAM

- A. Written program
- B. Equipment selection
- C. Care and Maintenance
- D. Medically fit
- E. Knowledge of hazards
- F. Recordkeeping

IX. EMPLOYEE FIT TEST EXERCISE

- A. Irritant Smoke Test
 - 1. Fit mask
 - 2. Close eyes
 - 3. Negative test
 - 4. Positive test
 - 5. Read "Rainbow Passage"

X. QUESTIONS AND ANSWERS

- A. Equipment
- B. Fit tests
- C. Applications
- D. Advantages/disadvantages

Fit Testing Procedure and Results

During the training phase of the Gunnison Respiratory Protection Program, employees will receive fit testing of their respective respirators. Employees will be assured of a positive fit.

The following procedure will be used:

1. Properly don an air purifying respirator
2. Conduct a Negative Pressure Test
3. Conduct a Positive Pressure Test
4. Close their eyes
5. Irritant smoke will be passed over the respirator
6. Employees will read the "Rainbow Passage"
7. If a leak is found, the test will be repeated
8. After the test a form will be completed describing the test and the type of respirator that was used for the test.

The "Rainbow Passage" is a phrase that is used to show that an adequate seal can be maintained when wearing a respirator. The passage requires the jaw to move various positions that could result in a leak. The employee will repeat the "Rainbow Passage" while wearing a respirator during the test. The "Rainbow Passage" reads as follows:

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long, round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Copies of each employees fit test results will be kept in this section of the Gunnison Respiratory Protection Program. A sample form has been included at the end of this section.

GUNNISON RESPIRATOR FIT TEST

1. DATE: _____
2. EMPLOYEE TESTED: _____
3. SIGNATURE: _____
4. TYPE OF RESPIRATOR: _____
5. RESPIRATOR MODEL: _____
6. POSITIVE FIT TEST: _____

7. NEGATIVE FIT TEST: _____

8. QUALITATIVE FIT TEST: _____
(IRRITANT SMOKE)

9. TEST CONDUCTED BY: _____

10. SIGNATURE: _____

LPG (LIQUID PROPANE GAS)

Propane is used in a wide variety of operations, including fueling vehicles, as a heat sources for heating or melting materials, weed burning operations, cutting, soldering, and heating buildings or equipment.

Basic Precautions

1. The material is extremely flammable. DO NOT smoke while using LPG.
2. Operate in only well ventilated areas.
3. Never puncture the container.
4. Keep the container away from sources of flame or heat.
5. Never incinerate the container.
6. Keep the container away from exposure to heat sources.
7. When changing propane cylinders, make sure that tank valves are closed before breaking connections. Check for leaks after change is complete using a soapy water solution.
8. Have a fire extinguisher or other firefighting equipment nearby when using propane.
9. Have a first aid kit nearby when using propane.
10. Use chemical goggles and leather gloves and cover extremities when working with propane, especially when lighting a pilot or burner on a propane system or changing system connections. Use of a Face shield is recommended while lighting pilot lights, especially when re-lighting after a pilot light has gone out.
11. Store excess cylinders securely and in a manner that protects the valve assembly from accidental blows. (Storage of liquefied petroleum gases shall be stored and handled in compliance with NFPA No. 58.[12] Taken from the "Handbook of COMPRESSED GASES second edition, Compressed Gas Association, Inc.)
12. NFPA hazard labels should be placed all cylinders. (Part of 29 CFR 1910.1200)
13. Never store excess cylinders near walkways, exits, and general path of travel.
14. Never store excess cylinders under stairs, decks, ramps, etc.
15. Never store cylinders together with oxygen sources or strong oxidants.
16. Always secure the valve opening with a cap or similar device when storing excess cylinders.
17. Prior to each use, inspect cylinders for signs of damage and/or wear.
18. Damaged cylinders must be taken out of service and replaced or repaired.
19. Periodically check cylinders to assure that they are inspected and approved for use. This inspection should also be performed each time a cylinder is brought on-site from an outside source.
20. Never attempt to repair a propane cylinder. Refer all repairs to qualified propane service personnel.
21. Never refill a cylinder that has exceeded the certification date. (5 years).
22. Never improperly dispose of cylinders. Return them to an authorized propane dealership for proper disposal.
23. Immediately report unsafe conditions to your Supervisor.

General Safe Work Practices

These work practices shall be observed when using propane fired equipment:

1. All employees using propane equipment must be adequately trained, and must carefully read and understand the Operator's Manual before using the equipment:
 - A. Read the igniting procedure before initiating the firing operation.
 - B. Learn the warning steps if the equipment does not ignite properly
 - C. Be familiar with the specific purge cycles for each pilot light system.
2. Inspect the equipment before use.
3. Be sure that the equipment is adequately maintained.
4. Become familiar with the MSDS that applies to propane.
5. Stay alert for the smell of propane.
6. Never work on propane powered equipment near energized electrical equipment.
7. Never refuel or re-charge propane cylinders near flames or excessive heat.
8. If you have problems with a pilot light, immediately shut off the equipment and refer to the operator's manual or contact your Supervisor.
9. Never force any gas controls.
10. If you cannot operate knobs, switches, valves, etc. on a propane system, contact your fleet maintenance or your Supervisor for assistance.
11. Do not tamper and/or alter any controls, valves, switches, etc.
12. Never use tools to turn valves, knobs, switches, etc. on a propane system.
13. Faulty propane equipment must be serviced immediately by qualified service personnel.
14. Be sure that NFPA hazard labels are attached to all cylinders.

Health Considerations

1. Propane can be both a heat and cold hazard to employees. Note that escaping propane gas can cause sudden freezing of exposed skin.
2. Know the basic first aid procedures for coming in contact with propane.
3. Be sure that an MSDS on propane is available in the area of operation.
4. Wear chemical goggles when working with propane.
5. Wear leather gloves and other protective clothing to cover extremities when working with propane.
6. Report injuries immediately.
7. Use propane in adequately ventilated work areas.

Personal Protective Equipment (PPE)

1. Wear chemical goggles when working with propane gas.
2. Wear leather gloves when working with propane gas.
3. Cover extremities with long sleeves when working with propane gas.
4. Wear a face shield if re-lighting a unit which has recently gone out.

Emergency Procedures

1. If you smell gas or see escaping propane gas, shut the equipment off.
2. If you smell gas or see escaping propane gas, never touch electrical switches, light matches or use electrical or electronic equipment.
3. If you smell gas or see escaping propane gas, shut off the main fuel supply.
4. If you smell gas or see escaping propane gas, call 911, secure the area from approach by the public or other workers, and contact your supervisor.
5. If you smell gas or see escaping propane gas, be cautious about creating sparks from static or ferrous metals

SECTION II – TRENCHING AND SHORING

CONFINED SPACES, TRENCHING & SHORING

CONFINED SPACE WORK

The term "confined space" is often misunderstood. The following introductory section is designed to be educational: it explains confined spaces and outlines their characteristics and hazards, with an explanation of the City confined space program. Actual City safety rules regarding confined spaces begin on page 28.

What is a confined space?

Unlike a trench or excavation, 'confined space' is not something easily visualized by the mind. Part of the reason for this is that a confined space can be almost anything.

However, it does have some common components that we can define.

1. It is not designed primarily for human occupancy.
2. It has restricted entry and exit...hence, confined.
3. It may contain a hazardous condition.

This third component is particularly hard to pin down: these spaces just as likely may not contain any hazardous condition. The unknown element here is a particular hazard with confined space because it can lull people into a false sense of security. This uncertainty is particularly true with atmospheric hazards which may not be readily perceived by the senses. Besides atmospheric hazards, other hazards that may be encountered in a confined space can be mechanical, electrical, entrapment, and engulfment.

What are some typical confined spaces?

In a municipality, sewer lines and manholes are among the most commonly encountered confined spaces. However, other common confined spaces found in municipal operations might include:

- storage tanks and trash containers
- utility pits
- tank trucks and trash trucks
- storm sewers
- lift stations
- trenches

Again, however, a confined space may be any space meeting the above three criteria, and failing to recognize or identify a confined space can be a hazard in itself.

Why are confined spaces hazardous?

The word that best describes the hazardous nature of a confined space is: "uncertainty". Often the conditions within a confined space appear benign. Workers enter such spaces routinely to make repairs, perform maintenance work, check readings of gauges or meters, clean, etc. At such times, the conditions within the confined space may have been harmless. In many instances the worker has performed the task within the confined space repeatedly without incident. Thus, the worker is lulled into a false sense of security that the space will always be harmless, or that any necessary escape from the space will be quick and easy.

However, because the space is confined, toxic or flammable atmospheres may become contained and concentrated. Mechanical or electrical hazards may be in direct proximity to the worker where they can be mangled or electrocuted. The worker can become entrapped or engulfed by material within the space. Because, by definition, a confined space has restricted entry and exit, escape becomes difficult or impossible. The worker thus may be seriously or fatally injured.

Another reason confined spaces can be hazardous is that workers fail to recognize a confined space as being such. It is important for the municipality to first identify every confined space that it has as the first step in a confined space safety program.

Common Hazards

Atmospheric Hazards

Atmospheric hazards can vary depending on the type of confined space. However, one potential atmospheric hazard common to most confined spaces is oxygen deficiency. There are numerous conditions that can cause oxygen deficiency. Furthermore, insufficient oxygen is a condition that cannot be sensed by the worker. The end result may be that the worker enters the space, gradually becomes faint, passes out, and perhaps dies from this lack of adequate oxygen.

Another common atmospheric hazard in sewers and manholes is sewer gas or hydrogen sulfide. Because it is heavier than air, this gas settles near the bottom of the confined space. In small concentrations, its typical 'rotten egg' smell is easily recognized. However, in higher concentrations it may not be smelled and can immediately cause unconsciousness. The worker can be dead in a matter of a few seconds.

Flammable or toxic atmospheres are another risk. Hydrogen sulfide, methane, carbon monoxide can all reach levels of explosive concentration. Petroleum products fumes can often be encountered in many confined spaces, as well as fumes of other flammable chemicals. A match, a spark from a hammer, static electricity, lighting a welding torch... all can easily cause an immediate explosion. Gases such as hydrogen sulfide and carbon monoxide are also very toxic and can cause death in relatively low concentrations.

Mechanical Hazards

Some confined spaces may contain mechanical equipment with sharp blades or other moving parts that can become accidentally energized and mangle a worker. Stored energy from springs or counterweights, for example, can be accidentally triggered causing the mechanical equipment to move suddenly and injure the worker.

Electrical Hazards

Like mechanical hazards, a confined space may also contain electrical equipment that can accidentally become energized and electrocute the worker.

Entrapment

Workers can become trapped within a confined space and die from exposure. The space can be unknowingly closed trapping a worker inside. Workers can drown inside a water line when an upstream valve is unknowingly opened. Some substances, such as asphalt, can cause entrapment due to their viscosity or "stickiness."

Engulfment

An example of this type of hazard would be a salt or sand bin where a worker walking on the surface of the substance in the bin can literally be swallowed by the motion of the material and suffocate.

In addition to these possible hazards, confined spaces may contain excessive heat causing heat exhaustion or can contain excessive noise requiring hearing protection. Dim or inadequate lighting may increase the likelihood of accident and injury.

What precautions are needed in confined spaces?

Identify All Confined Spaces

You should begin by identifying every confined space that workers may be required to enter within the scope of their work. Applicable employees then need to be informed of the existence, locations and dangers of these spaces by posting danger signs or other equally effective means.

Permit Entry System

Many injuries and deaths occur in confined spaces because a worker enters a confined space without telling anyone or because management fails to alert the worker to a known hazard that the worker may be unaware of. To prevent these tragic occurrences, a permit entry system needs to be developed. Such a system requires that a permit be completed for any worker to enter into a confined space. The permit forces both the worker(s) and management to recognize the confined space as being a hazard, identify the hazards that may be encountered upon entry, require any testing of the atmosphere, safety equipment, attendants, rescue equipment, etc. OSHA regulations and the City Safety Regulations (provided at the end of this section) require the use of a permit entry system when entering confined spaces.

Testing

Testing for atmospheric hazards is also an OSHA requirement. Many hazardous atmospheres cannot be detected by our sense of smell. These include carbon monoxide, oxygen deficiency, methane, and large concentrations of hydrogen sulfide. Without testing, the worker's first clue to the presence of the hazard might be sudden collapse and subsequent death. Testing of a confined space thus becomes critical. Furthermore, since such hazardous substances tend to be heavier than air and displace air, testing of the confined space must be done at the bottom of the confined space especially, although the rest of the space also needs to be tested.

Safety Equipment

The permit entry system needs to address individual items of safety equipment needed for each confined space. This might include respirators, hard hats, safety harnesses, etc. This would also include emergency equipment necessary for any rescue such as a rescue tripod, winch, first aid kit, etc.

Monitoring

For prolonged periods of work in a confined space, provision for continued monitoring of the space may be necessary. Portable monitoring devices may be needed to detect and warn workers of changing atmospheric hazards.

Ventilation

One of easiest methods of reducing or eliminating hazardous atmospheres, particularly in manholes and sewer lines, is through ventilation. Mechanical blowers can eliminate many hazardous atmospheres if properly set up and used.

Observation

No worker should enter a confined space without a trained attendant standing by to summon help or operate a man-lift in the event of an emergency. The attendant is part of the permit entry system.

Training

As with any hazardous activity, training is essential to prevent accidents and fatalities. Equally important is the periodic use of emergency drills. Such drills help ensure that employees respond properly in emergency situations. Training should be documented and records maintained. Contact Risk Management or the insurance loss control representative for confined space training.

CONFINED SPACE SAFETY REGULATIONS

Following are listed the safety regulations that apply to all City operations when a confined space must be entered. However, some City locations may have their own specific confined space entry program. If you are working in one of these areas, consult this program for more detailed instruction.

1. Review the specific Confined Space Program of the department or facility before beginning work.
2. Any vessel entered shall be properly blinded and/or isolated before work begins.
3. The vessel will be clean, gas free and contain adequate oxygen concentration before entry is permitted.
4. An Entry Permit shall be issued before anyone enters a permit-required confined space.
5. A Confined Space Attendant shall be assigned to the work area. The attendant will be adequately trained in the duties of a Confined Space Attendant as defined in OSHA regulations.
6. A Confined Space Attendant shall not leave the area when personnel are working inside a confined space.
7. The potential hazards of a confined space will be determined prior to entering the confined space.
8. All personnel entering the confined space will be adequately trained.
9. Personnel entering the confined space will be briefed by their supervisor as to the risks of the operation.
10. The confined space atmosphere shall be monitored on a regular basis. The area should be retested after breaks or lunch periods.
11. Do not enter a confined space unless you are properly attired to do so.
12. Contact a supervisor if assistance is required. Never enter a confined space when unsure of the hazards.
13. Rescue involving a confined space shall not be attempted unless the rescuers are qualified and properly trained and equipped for confined space rescue.
14. Do not attempt rescue without appropriate personal protective equipment.
15. Immediately report any confined space incident and/or accident to your supervisor.
16. If unsure or further information is needed, consult OSHA Standard 29 CFR 1910.146.

TRENCHING AND SHORING OPERATIONS:

All City trenching and shoring operations are to be conducted according to OSHA standard 29 CFR part 1926.650 - .652 Subpart P. These standards are contained in a separate more manageable size field manual titled "Construction Standards for Excavations". This handbook should be available and in use by all work groups whose employees are required to enter excavations, even for short periods of time.

The Nature Of Trenching And Excavation Accidents

Studies show that trenching and excavation work is one of the most hazardous activities performed in the construction and utility industry. Excavation and trench cave-ins result in more than one hundred fatalities annually in the United States. With little or no warning, an unsupported, improperly-shored or sloped trench or excavation wall can collapse, trapping workers below in seconds. For each fatality, there are an estimated fifty related serious injuries. In addition to loss of life due to excavating and trenching accidents, the financial cost of property damage, work stoppage, and workers' compensation claims can be substantial.

Most trenching and excavation accidents are a result of inadequate planning, inadequately trained employees, failure of employees to identify and heed a hazard, inadequately designed or installed protective systems, or the disregard for trenching and excavation safety policies and procedures. City employees may have to work in trenches and excavations when repairing or installing water and sewer lines, constructing storm water pipes, pits and other tasks. Therefore, it is imperative that the safeguards described in this program are followed.

Causes Of Cave-Ins

All soil possesses a certain degree of cohesive strength that tends to hold individual particles together. Once an excavation is made, the soil's natural strength is affected by the downward force of gravity. When cohesive strength is overcome by this downward force, the side walls collapse and the trench caves in. The soil strength and downward force are affected by the following factors:

1. Soil Type - Loose-grained sandy soils have little cohesive strength and tend to cave-in easily if they are unsupported. Clays and silts generally tend to stick together and be self-supporting.
2. Recent Excavations - Soil that has never been disturbed is stronger than soil that has been previously excavated. The more recently the soil has been disturbed, the weaker it will be.
3. Moisture - Water has a decided effect on the cohesiveness of soil. Too much water affects the ability of soil particles to stick together, allowing them to slide and move more easily. This can be especially critical when repairing water or sewer line breaks. Conversely, too little water results in drying which can cause soil to crack and collapse.
4. Freezing and Thawing - When water freezes, it expands, and when ice thaws, it contracts. Movement resulting from expansion and contraction during freeze-thaw cycles can affect both shoring materials and soil stability. A cave-in can occur without warning as a mid-morning sun thaws the excavation's face.
5. Surcharged Loads - Construction materials, heavy equipment and the weight of the spoil piles all contribute to the downward force on soil. The greater the

surcharged load (excessive load), the less stable the soil will be and more likely it will fail.

6. Shock and Vibration - Moving trains, highway traffic, pile driving and blasting are all sources of vibration which can affect the cohesiveness of soil and weaken excavation walls.
7. Intersecting Trenches - The point formed by the intersection of two trenches is quite vulnerable to collapse. If not properly protected, a large wedge-shaped chunk of soil can easily break off and fall in the point of the intersection.

RESPONSIBILITIES FOR TRENCHING AND EXCAVATIONS

1. Department Heads - Department heads have overall responsibility for ensuring that any trenching or excavation work done by City employees is performed in a safe manner. They shall be responsible for the following:
 - A. Providing the time and resources to ensure that an adequate number of City employees under their responsibility (including supervisors) receive adequate training to be designated as "competent persons". Refresher training shall be provided as needed.
 - B. Providing the time and resources to ensure that all employees involved in trenching and excavation work receive training to perform their individual responsibilities in a safe manner.
 - C. Providing the resources and approvals necessary to acquire safety equipment and protective systems so employees can perform their jobs in a safe manner.
 - D. Insisting that all trenching and excavation work be performed in a safe manner.
 - E. Assisting in the development of initial work plans for each trenching and excavation job.
 - F. Investigating any trenching and excavation accidents and taking appropriate action to prevent any recurrences.
2. Competent Persons - A "competent person" is a City employee (or contractor employee) who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

At least one competent person shall be on-site during all trenching or excavation operations. The City shall maintain an up-to-date list of competent persons. The competent person is responsible for employee safety at each specific job including but not limited to the following:

 - A. Locating and protecting underground installations.
 - B. Recognizing, testing and controlling potentially hazardous atmospheres.
 - C. Removing or supporting hazardous surface encumbrances.
 - D. Monitoring the equipment and operation of water removal.
 - E. Protecting employees from loose rocks or soils.
 - F. Conducting daily inspections of excavations, adjacent areas and protective systems.
 - G. Determining the impact of distress and/or surcharge loads and adjust the protective systems accordingly.
 - H. Training employees to perform their jobs in a safe manner.

- I. Removing employees from hazardous conditions until the necessary precautions have been taken to ensure their safety.
 - J. Conducting soil classifications as necessary.
3. Employees - All employees have a responsibility to themselves and their fellow employees for the prevention of accidents by following all safety procedures and performing assigned work without injury. Employees are expected to perform all trenching and excavation work according to the procedures set forth in this program. As each employee is the person most concerned with his or her safety, he or she must assume certain duties and responsibilities to assure on-the-job safety, including recognizing the hazards of trenching and excavation work and taking precautions to ensure the safety of themselves and co-workers.
4. Training - It is essential that competent persons and other employees receive adequate training so they have the knowledge and skills to perform trenching and excavation activities in a safe manner.
- A. Competent persons shall receive at least eight hours of initial training and annual refresher training of at least four hours. Employees who are required to work in or around trenches and excavations shall receive at least 4 hours of initial training and annual refresher training of at least two hours. This training is minimum and may be expanded and repeated as deemed necessary by individual departments.
 - B. Training shall be conducted by person(s) knowledgeable in trench safety practices. Training shall include, but is not limited to, the causes of trench cave-ins, work site protection, communications, utility identification, access and egress, hazardous atmospheres, water hazards, fall protection, emergency situations, use and limitations of protective systems, and other trench safety requirements.
 - C. Training shall be documented on the Training Log in Appendix I, or equivalent form, and kept on file by the applicable supervisor. A copy of each Training Log shall be sent to the Risk Management Division.

General Safety Procedures

1. INITIAL WORK PLAN - The supervisor or competent person with responsibility for completing trenching and excavation work shall develop an initial work plan consistent with the potential hazards of the job. Where practical, the work plan shall be developed in advance of commencing the job. The work plan shall include the following items:
- A. Determination of the type of work to be performed and the potential hazards that may be encountered including but not limited to traffic, nearness of other structures, soil type, surface and ground water, overhead and underground utilities, and anticipated weather conditions.
 - B. Arrange for adequate tools, personal protective equipment, protective devices, and other materials and equipment. Standard personal protective equipment (PPE) includes hard hats, safety shoes, reflective vests, eye protection and gloves. Other PPE may be needed as specific job hazards dictate.
 - C. Reviewing trenching and excavation safety procedures and job hazards with applicable employees.

- D. Coordination of job site safety procedures with contractors, other public entities and the general public as needed.
 - E. Providing communication equipment and establishing procedures for notifying emergency and rescue personnel in the event of a cave-in or other serious accident.
2. TRENCHING AND EXCAVATION FIELD SAFETY CHECKLIST
- A. The Trenching and Excavation Field Safety Checklist (See Appendix G) shall be completed on all job sites before personnel are allowed to enter any trench or excavation.
 - B. The Checklist shall be completed by the competent person in charge of the job.
 - C. If the job extends for more than one day, a new Checklist shall be completed at the beginning of each day.
 - D. Any trench or excavation determined to be a confined space shall meet all applicable requirements of the City Confined Space Entry Program.
 - E. Checklists shall be kept on file for a period of one year.
3. WORK SITE PROTECTION - Upon arrival at the work site, the competent person shall determine the safeguards required to protect the trenching and excavation area. Any action taken shall comply with Administrative Directive 8-3, Traffic Control Procedures.
- A. Provide warning devices and visibility devices to alert any vehicular or pedestrian traffic.
 - B. Arrange for proper traffic flow and channeling through and/or around the work area.
 - C. Protect the trench or excavation from exhaust fumes, flowing water, or other potential dangers or contaminants.
 - D. Clear and maintain a safe work area around the trench or excavation to prevent any soil, vehicles, equipment or other materials from falling into and striking employees.
4. COMMUNICATIONS
- A. Two-way communications shall be readily available at the job site and a monitored communication base station any time employees are working in a trench or excavation.
 - B. All City base communication stations shall keep updated lists of all appropriate fire and police department numbers readily available.
 - C. Any trench or excavation determined to be classified as a permit required confined space shall meet all applicable communication procedures described in the City Confined Space Entry Program.
5. UTILITY IDENTIFICATION - Employees may be exposed to serious hazards such as flooding, electrical shock, asphyxiation, fires and explosions resulting from damage to underground installations. In addition, the City may be responsible for the costs to repair or replace damaged utilities. Therefore, it is essential that reasonable attempts be made to locate gas, electric, telephone, fiber optic, sewer, water and other installations before digging begins. Appropriate contact with utility owners must be made to advise them of the proposed work and have them establish the location of the utility's underground installation prior to the start of actual excavation. For utilities not owned or operated by the City, this task can be simplified by contacting the Utility

Notification Center of Colorado to coordinate the activities of City with utility owners.

- A. For utilities locates, contact the Utility Notification Center of Colorado at 1-800-922-1987 for line locations. Where possible, call the Center at least two business days in advance of the dig. The Center may also be notified in writing using the appropriate form.
- B. Inform the Center of the intent to excavate. Be specific on the address, extent and duration of the excavation. **IF IT IS AN EMERGENCY LOCATE, TELL THE CENTER NOW!** For routine locates, the Center will ask the following:

- (1) Identification of Caller
- (2) Phone Number
- (3) Job Location
- (4) Type of Work
- (5) Date and Time of Work

- C. The Center will contact all utilities that may have services in the job area. Utilities have 2 working days to locate and mark their respective underground lines for routine location requests.
- D. For an emergency locate, advise the Center that the locate is needed for an out-of-service condition and is considered an emergency. Normally, within one hour, the emergency locates will be completed. If locator response is slow, continue to call and inform the Center.
- E. After locating underground lines, the utility personnel will paint marks on the ground showing the approximate location of the lines and will sometimes implant small flags along the course of the line. The underground lines are marked according to the following color scheme:

<u>Utility</u>	<u>Paint Color</u>
Gas	Yellow
Telephone	Orange
Fiber Optics	Orange with Circle Symbol
Water	Blue
Sewer	Green
Electric	Red

- F. When a utility company or owner of the underground lines cannot respond to a request to locate underground utility installations within the 48 hours or cannot establish the exact location of the installations, the excavation can proceed provided City personnel do so with caution and provided detection equipment or other acceptable means to locate utility installations are used.
- G. When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means. Use extreme caution while excavating around any utility. Hand dig when necessary. The utility owner must mark the location of the underground line within 18 inches horizontally from the exterior sides of the line along with the depth thereof
- H. While the excavation is open, underground utility installations shall be protected, supported or removed as necessary to safeguard employees.

- I. If a utility line is accidentally damaged, notify the utility owner immediately. Document the situation carefully if necessary. If the utility was not marked correctly ensure this information is well documented. Notify the City Risk Management Division as soon as possible after securing the area.
 - J. After the excavation and repair/installation is complete but before backfilling, make a schematic drawing of the excavation documenting all underground utilities, their purpose, function, size and depth. Record this information on the back of the Trenching and Excavation Field Safety Checklist.
6. SURFACE ENCUMBRANCES - All surface encumbrances (such as trees and boulders) that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.
7. ACCESS AND EGRESS
- A. Structural ramps:
 - (1) Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.
 - (2) Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.
 - (3) Structural members used for ramps and runways shall be of uniform thickness.
 - (4) Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.
 - (5) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.
 - B. Means of egress from trench excavations:
 - A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are more than 4 feet or more in depth, so as to require no more than 25 feet of lateral travel for employees.
8. EXPOSURE TO VEHICULAR TRAFFIC - Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked or made of reflectorized high-visibility material.
9. EXPOSURE TO FALLING LOADS - No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles when the vehicles are equipped with adequate protection for the operator during loading and unloading operations.
10. WARNING SYSTEMS FOR MOBILE EQUIPMENT - When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the excavation, a warning system shall be utilized such as barricades, hand or mechanical systems or stop logs. If possible, the grade should be away from the excavation.
11. HAZARDOUS ATMOSPHERES - Excavations dug near gas stations, chemical plants, storage tanks, sewer lines, and landfills may contain hazardous atmospheres formed by liquids, gases, and vapors which may seep through the soil. The competent person must be alert for these conditions and ensure that proper safeguards are in place.

- A. Where hazardous atmospheres exist or could develop, the City's Confined Space Entry Program shall be followed including provisions related to monitoring, ventilation, entry permits, entry precautions, attendant/entrant requirements, personal protective equipment and rescue/safety equipment, rescue operations, and emergency entrance situations.
 - B. Atmospheric testing shall be conducted in excavations over 4 feet deep when hazardous atmospheres could or may exist.
 - C. Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.
12. PROTECTION FROM THE HAZARDS OF WATER ACCUMULATION - Water is a trench's worst enemy. Accumulation resulting from rain, melting snow, or leakage from broken water or sewer lines can saturate the side walls of excavations and weaken them. Flowing water can erode materials from shoring systems to the point of failure. Henceforth, the following procedures apply when working in excavation where water may be present:
- A. Employees shall not work in excavations in which there is accumulated water, or in excavations where water is accumulating, unless adequate precautions have been taken to protect against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
 - B. If water is controlled or prevented from accumulating by use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.
 - C. If excavation work interrupts the natural drainage of surface water (such as streams) diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with sections (a) and (b) above.
13. STABILITY OF ADJACENT STRUCTURES
- A. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.
 - B. Excavations below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:
 - (1) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
 - (2) The excavation is in stable rock; or
 - (3) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

- (4) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.
- C. Sidewalks, pavements, and other structures shall not be undermined unless a support system or other method of protection is provided to protect employees from possible collapse of such structures.
14. PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL
- A. Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.
- B. Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.
15. INSPECTIONS
- A. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
- B. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
16. FALL PROTECTION
- A. Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
- B. Adequate barrier physical protections shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded, covered or backfilled.
17. INSPECTION OF CONTRACTOR WORK - From time to time, City employees may need to inspect work performed by private contractors associated with the City's utilities and other jobs. City employees are expected to follow the policies and procedures spelled out in this document when required to enter a contractor's trench to perform an inspection or do other work. If an unsafe condition exists, the City employee shall contact his or her supervisor and will not enter the excavation until the hazardous condition has been removed. Private contractors are required to comply with applicable OSHA regulations on trenching and excavations.
18. EMERGENCY AND RESCUE SITUATIONS - In the event of a trench collapse or other emergency situation where lives may be at stake, the following emergency and rescue procedures shall apply:

- A. Call dispatch to report the emergency and the need for rescue/emergency assistance from the City Police Department, the Fire Protection District, utilities, and other agencies.
- B. Dispatch shall notify the appropriate emergency agency(s) for emergency assistance
- C. Attempt to notify the applicable supervisor, Risk Management Division, and media spokesperson for the City, of the emergency.
- D. If any person(s) are buried within the trench, mark the location where they were last seen.
- E. Utilize appropriate emergency equipment to rescue personnel. Do not enter the trench to attempt emergency rescue if known dangers within the trench are immediately life threatening. Wait for rescue crews.
- F. Assist emergency/rescue personnel as requested to mitigate the emergency.
- G. Assist in securing the area and eliminating any hazardous conditions. Keep the general public away from any hazardous areas.
- H. Conduct an accident investigation and the complete the appropriate report forms.

Requirements For Protective Systems

1. TYPES OF PROTECTIVE SYSTEMS - Various alternatives exist for protecting employees while working in trenches and excavations. These include sloping and benching, shield systems, timber shoring, aluminum hydraulic shoring, and other protective systems. Specific requirements exist for the design and use of these systems. City employees shall follow the applicable OSHA regulation and appendix detailed in this document plus the manufacturers instructions when using any of the protective systems.

The City's aluminum shoring system will be in use by employees when working in trenches and excavations. Specific instructions for installing this system are included in the manufacturer's information located in the Water Department shop. The use of the shoring system and any other protective system must be done so under the supervision of a competent person.

The shoring system is kept on a trailer in the City of Gunnison Public Works Facility located at 1100 W. Virginia Ave, Gunnison, CO. It is permanently assigned to the Public Works Water Department. Water Department personnel will take the trailer to all water breaks per Section II.C.8. of Directive 1.20 (WATER BREAK PROCEDURES). The shoring system shall be utilized to protect employees while working in trenches or excavations as required.

Other City departments may utilize the shoring system for trenching jobs provided the system is available, will provide adequate protection for the employees in the trench, and a competent person trained in the use of the shoring system is available to supervise the job.

If the shoring system is unavailable or will not provide adequate protection for employees working in a trench or excavation, an alternative protective system shall be used. The selection of the type of system, its design, installation and

use shall be made by appropriate City employees, including a competent person, and a registered professional engineer as necessary.

Listed below are general as well as specific requirements for various types of protective systems.

2. PROTECTION OF EMPLOYEES IN EXCAVATIONS - GENERAL
 - A. Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with the requirements below except when:
 - (1) Excavations are made entirely in stable rock.
 - (2) Excavations are less than five (5) feet deep and examination by a person provides no indication of a potential cave-in. Many trenches less than five (5) feet deep have caved-in causing serious injuries. Extreme care must be taken when working in shallow trenches as well.
 - C. Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.
3. DESIGN OF SLOPING AND BENCHING SYSTEMS - The slopes and configurations of sloping and benching systems shall be selected and constructed in accordance with one of the following requirements:
 - A. Allowable configurations and slopes - Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal). Such slopes shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B of this document.
 - B. Determination of slopes and configurations using Appendices A and B - Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B on this document.
 - C. Designs using other tabulated data - Designs of sloping or benching systems shall be selected from and be in accordance with tabulated data, such as charts and tables. The tabulated data shall be in written form and shall include all of the following:
 - (1) Identification of the parameters that affect the selection of a sloping or benching system drawn from such data;
 - (2) Identification of the limits of use of the data to include the magnitude and configuration of slopes determined to be safe;
 - (3) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.At least one copy of the tabulated data which identifies the registered professional engineer who approved the data, shall be maintained at the jobsite during construction of the protective system. After that time, the data may be stored offsite.
 - D. Designed by a registered professional engineer - Sloping and benching systems not utilizing option a, b, or c above shall be approved by a registered professional engineer. Designs shall be in writing and shall include at least the following:

- (1) The magnitude of the slopes that were determined to be safe for the particular project;
- (2) The configurations that were determined to be safe for the project; and
- (3) The identity of the registered professional engineer approving the design.

At least one copy of the design shall be kept at the jobsite while the slope is being constructed. After that time, the design may be kept offsite.

4. DESIGN OF SUPPORT SYSTEMS, SHIELD SYSTEMS, AND OTHER PROTECTIVE SYSTEMS - Designs of support systems, shield systems and other protective systems shall be selected and constructed in accordance with one of the following requirements:

- A. Designs using appendices A, C, and D - Designs for timber shoring in trenches shall be determined in accordance with the conditions and requirements set forth in appendices A and C of this document. Designs for aluminum hydraulic shoring shall be in accordance with appendix D or manufacturers tabulated data.
- B. Designs using manufacturer's tabulated data - Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.
 - (1) Deviations from the specifications, recommendations or limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.
 - (2) Manufacturer's specifications, recommendations and limitations and any deviations shall be in written form at the jobsite during construction of the protective system. After that time, the data may be stored offsite.
- C. Designs using other tabulated data - Designs of support systems, shield systems, or other protective systems shall be selected from and be in accordance with tabulated data, such as tables and charts. The tabulated data shall be in written form and include all of the following:
 - (1) Identification of the parameters that affect the selection of a protective system drawn from such data;
 - (2) Identification of the limits of use of the data;
 - (3) Explanatory information as may be necessary to aid the user in making a correct selection of a protective system from the data.

At least one copy of the tabulated data, which identifies the registered professional engineer who approves the data, shall be maintained at the jobsite during construction of the protective system. After that time, the data may be stored offsite.

- D. Designed by a registered professional engineer - Support systems, shield systems, and other protective systems not utilizing options a, b, or c above, shall be approved by a registered professional engineer. Designs shall be in written form and shall include the following:
 - (1) A plan indicating the sizes, types, and configurations of the materials to be used in the protective system; and

- (2) The identity of the registered professional engineer approving the design.

At least one copy of the design shall be maintained at the jobsite during the construction of the protective system. After that time, it may be stored offsite.

5. MATERIALS AND EQUIPMENT

- A. Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function.
- B. Manufactured materials and equipment used for protective systems shall be used and maintained in a manner that is consistent with the recommendations of the manufacturer, and in a manner that will prevent employee exposure to hazards,
- C. When material or equipment that is used for protective systems is damaged, a competent person shall examine the material or equipment and evaluate its suitability for continued use. If the competent person cannot assure the material or equipment is able to support the intended loads or is otherwise suitable for safe use, then such materials and equipment shall be removed from service, and shall be evaluated and approved by a registered professional engineer before being returned to service.

6. INSTALLATION AND REMOVAL OF SUPPORT SYSTEMS

- A. General:
 - (1) Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.
 - (2) Support systems shall be installed and removed in manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.
 - (3) Individual members of support systems shall not be subject to loads exceeding those which the members were designed to withstand.
 - (4) Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
 - (5) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-ins of the sides of the excavation.
 - (6) Backfilling shall progress together with the removal of support systems from excavations.
- B. Additional requirements for support systems for trench excavations:
 - (1) Excavation of material to a level no greater than 2 feet below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there is no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system.

- (2) Installation of a support system shall be closely coordinated with the excavation of trenches.
7. **SLOPING AND BENCHING SYSTEMS** - Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at lower levels are adequately protected from the hazards of falling, rolling or sliding material or equipment.
8. **SHIELD SYSTEMS**
 - A. Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.
 - B. Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of application of scudded lateral loads.
 - C. Employees shall be protected from hazards of cave-ins when entering or exiting the areas protected by shields.
 - D. Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
 - E. Excavations of earth materials to a level not greater than 2 feet below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depths of the trench, and there is no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

Definitions

These definitions apply to all open excavations and trenches made in the earth's surface.

Accepted engineering practices - those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring - pre-engineered shoring system comprised of aluminum hydraulic cylinders (cross braces) used in conjunction with vertical rails (uprights) or horizontal rails (walers). Such system is designed, specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole - a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) - a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in - the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Competent person - one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces - the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation - any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides - the vertical or inclined earth surfaces formed as a result of excavation work.

Failure - the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere - an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout - the accidental release or failure of a cross brace.

Protective system - a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp - an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer - a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Sheeting - the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) - a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) - a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping (Sloping system) - a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such

factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock - natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp - a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system - a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data - tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation) - a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Uprights - the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales - horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

APPENDIX A - SOIL CLASSIFICATION

This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, requirements, and describes acceptable visual and manual tests for use in classifying soils.

DEFINITIONS

Cemented Soil

A soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive Soil

Clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical side slopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clay, silt, sandy clay, silty clay, clay and organic clay.

Dry Soil

Soil that does not exhibit visible signs of moisture content.

Fissured

A soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular Soil

Gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered System

Two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist Soil

A condition in which a soil looks and feels damp. Moist cohesive soils can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic

A property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated Soil

A soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil Classification System

A method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the characteristics of the deposits and the environmental conditions of exposure.

Stable Rock

Natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged Soil

Soil which is underwater or is free seeping.

Type A Soil

Cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- 1) The soil is fissured; or
- 2) The soil is subject to vibration from heavy traffic, pile driving, or similar effects;

or

- 3) The soil has been previously disturbed; or
- 4) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- 5) The material is subject to other factors that would require it to be classified as a less stable material.

Type B Soil

- 1) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
- 2) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam; or
- 3) Previously disturbed soils except those which would otherwise be classed as Type C soil; or
- 4) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or
- 5) Dry rock that is not stable; or
- 6) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C Soil

- 1) Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
- 2) Granular soils including gravel, sand, and loamy sand; or
- 3) Submerged soil or soil from which water is freely seeping; or
- 4) Submerged rock that is not stable; or
- 5) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined Compressive Strength

The load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet Soil

Soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

REQUIREMENTS

Classification of Soil and Rock Deposits

Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in this appendix.

Basis of Classification

The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analysis shall be conducted by a competent person using tests described in this appendix.

Visual and Manual Analysis

The visual and manual analysis shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

Layered Systems

In a layered system, the system will be classified in accordance with its weaker layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

Reclassification

If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit will be reclassified as necessary to reflect the changed circumstances.

ACCEPTABLE VISUAL AND MANUAL TESTS

Visual Tests

Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

- 1) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular.

- 2) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- 3) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- 4) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
- 5) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
- 6) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
- 7) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

Manual Tests

Manual analysis of soil samples is conducted to determine quantitative as well as qualitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

- 1) **Plasticity**
Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
- 2) **Dry Strength**
If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
- 3) **Thumb Penetration**
The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of soil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later

exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

4) Other Strength Tests

Estimates of unconfined compressive strength of soils can also be obtained by use of pocket penetrometer or by using a hand-operated sheervane.

5) Drying Test

The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material.

The procedure for the drying test involves drying a sample of soil that is approximately one inch thick and six inches in diameter until it is thoroughly dry:

a) If the sample develops cracks as it dries, significant fissures are indicated.

b) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.

c) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

APPENDIX B - SLOPING & BENCHING

This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins.

DEFINITIONS

Actual Slope

The slope to which an excavation face is excavated.

Distress

The soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum Allowable Slope

The steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short Term Exposure

A period of time less than or equal to 24 hours that an excavation is open.

Requirements

1. Soil Classification
 - Soil and rock deposits shall be classified in accordance with Appendix A.
2. Maximum Allowable Slope
 - The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.
3. Actual Slope
 - A. The actual slope will not be steeper than the maximum allowable slope.
 - B. The actual slope will be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope will be cut back to an actual slope which is at least 1/2 horizontal to one vertical (1/2 H : 1 V) less steep than the maximum allowable slope.
 - C. When surcharge loads from stored material or equipment, operating equipment, or traffic is present, a competent person will determine the degree to which the actual slope must be reduced below the maximum allowable slope, and will assure that such reduction is achieved.
 - D. Configurations
 - Configurations of sloping and benching systems will be in accordance with Figure B-1.

APPENDIX C - ALUMINUM HYDRAULIC SHORING FOR TRENCHES

This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that do not exceed twenty feet in depth.

Soil Classification

In order to use data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method in Appendix A.

Basis and Limitations of the Data

1. Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D-1 tables. Aluminum material is 6061-T6 or material of equivalent strength and properties.
2. Hydraulic cylinders specifications.
 - A. Two inch cylinders shall be a minimum two inch inside diameter with a minimum safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.
 - B. Three inch cylinders shall be a minimum three inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.
3. Limitation of application.
 - A. It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice.
 - B. When any of the following conditions are present, the members specified in these tables are not considered adequate. In this case, an alternative system must be designed as appropriate.
 - 1) When vertical loads imposed on crossbraces exceed a 100 pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.
 - 2) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.
 - 3) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless:
The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

APPENDIX F - SELECTION OF PROTECTIVE SYSTEMS

The following figures are a graphic summary of the requirements for excavations twenty (20) feet or less in depth. Protective systems for use in excavations more than twenty (20) feet in depth must be designed by a registered professional engineer.

FIGURE 1 - PRELIMINARY DECISIONS

Is the excavation more than 5 feet in depth?	NO	YES
Is there potential for cave-in?	NO	YES
Is the excavation entirely in stable rock?	NO	YES
Excavation may be made with vertical sides.	NO	YES
Excavation must be sloped, shored, or shielded.	NO	YES

Sloping selected.

Shoring or shielding selected.

Go to Figure 2

Go to Figure 3

FIGURE 2 - SLOPING OPTIONS

Sloping selected as the method of protection

Will soil classification be made in accordance with Appendix A

NO

YES

Excavation must comply with one of the following three options:

Excavations must comply with Section 3a., page 17 which requires a slope of 12H:1V (34R).

Option 1:

Section 3b., page 17 which requires Appendices A and B to be followed.

Option 2:

Section 3c., page 17 which requires other tabulated data (see definition) to be followed.

Option 3:

Section 3d., page 17 which requires the excavation to be designed by a registered professional engineer.

APPENDIX F - Continued

FIGURE 3 - SHORING AND SHIELDING OPTIONS

Shoring or shielding selected as the method of protection.

Soil classification is required when shoring or shielding is used. The excavation must comply with one of the following four options:

Option 1:

Section 4a., page 18 which requires Appendices A and C to be followed (e.g. timber shoring).

Option 2:

Section 4b., page 18 which requires manufacturers data to be followed (e.g. hydraulic shoring, trench jacks, air shores, shields).

Option 3:

Section 4c., page 18 which requires tabulated data (see definition) to be followed (e.g. any system as per the tabulated data).

Option 4:

Section 4d., page 19 which requires the excavation to be designed by a registered professional engineer (e.g. any designed system).

APPENDIX G - TRENCHING & EXCAVATION FIELD SAFETY CHECKLIST

Date/Time _____ Weather _____ Previous Rainfall _____

Job _____ Location _____

I hereby attest that the following conditions existed and that the following items were checked or reviewed during this inspection.

Signature _____ Date/Time _____
(Competent Person)

Soils (See Appendix A)

() Soil Classification _____ (Soil Type)

Classification determined by: () Visual Test () Manual Test

- Other: () Zones of weak soils or fracture planes in material.
- () Evidence of shrinkage cracks in or on trench walls.
- () Evidence of possible cave-in or slide.

Protection Method Used (See Appendix B & C)

- () Slope or Bench System
- () Trench Shoring
- () Other (Describe)

Encumbrances/Hindrances to the Excavation

- () Above Ground () Below Ground () Excessive Weight Loads

Comments

Excavating Requirements

- 1) Are proper barricades, cones, warning vests, and other personal protective equipment in use when appropriate? () Yes () No () N/A
- 2) Have underground utilities been properly located? () Yes () No () N/A

Utility Colors:

- Gas - (Yellow) Telephone - (Orange) Electric - (Red)
- Water - (Blue) Sewer (Green) Fiber Optics - (Orange with Circle Symbol)

- 3) Have all surface encumbrances been removed? () Yes () No () N/A

- 4) Do trenches 4 to 5 feet deep or more have an adequate means of exit, such as ladders or steps, located where no more than 25 feet of travel is required?
() Yes () No () N/A
- 5) Do the walls and faces of trenches 5 feet or deeper and all excavations in which employees are exposed to danger from moving ground or a cave-in have a protection system, i.e. shoring, sloping, or some equivalent means?
() Yes () No () N/A
- 6) Is shoring properly installed and secure with an adequate safety factor for the equipment being used? () Yes () No () N/A
- 7) If using slope/bench protection method are slopes cut at the proper design angle of repose? () Yes () No () N/A
- 8) Have excavated or other materials been effectively stored and retained at least 2 feet or more from edge of excavation? () Yes () No () N/A
- 9) Have adjoining building, walls, pavements, and sidewalks been braced and protected from undercuts? () Yes () No () N/A
- 10) Have guardrails been provided when employees are required to cross a walkway at an excavation site? () Yes () No () N/A
- 11) Oxygen deficiency or hazardous condition exist? () Yes () No () N/A
- 12) Has a barricade, stop log, or hand signal been provided when equipment is required close to the excavation? () Yes () No () N/A
- 13) Is water accumulation a problem?
() Yes () No () N/A
If yes, is water being removed to protect workers?
() Yes () No () N/A

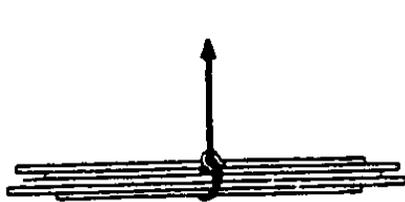
Comments:

Emergency: Mark last known location of victim(s) in trench.
Telephone: Dial 911 and request assistance

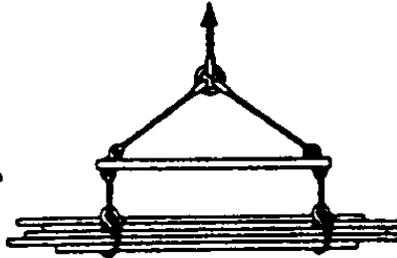
SECTION III – ELECTRIC SAFETY PRACTICES

TRAFFIC AND MOTOR VEHICLE OPERATION

Good And Bad Rigging Practices

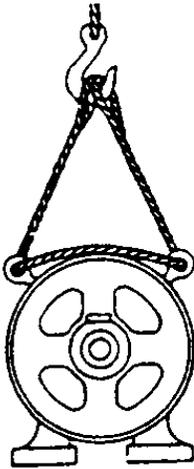


Wrong—Load over 12' long

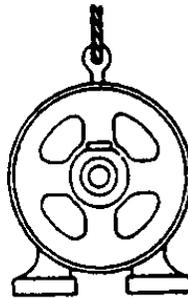


Right—Load over 12' long

Eye Bolts



Vertical lift on eyebolt is good practice



Bad Practice—Lifting on eye bolts from an angle reduces safe loads as much as 90%

Suspending Needle Beams or Scaffolds

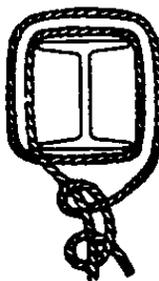
Hoisting Structural Steel



Bad Practice—Can bend flanges and cut rope



Good Practice—Use space blocks and pad corners



Bad Practice—Steel can cut rope



Good Practice—Sharp corners padded

Pole Handling

1. The term "Pole Handling" includes the loading and unloading of transporting equipment in places of storage and the transportation and unloading of poles in the field. It does not include setting, removing, etc., which are treated separately.
2. Pole handling methods shall follow a set procedure and each phase of each operation shall follow in its proper sequence.
3. Only methods, tools, and equipment approved by the superintendent shall be used in pole-handling operations.
4. Employees shall not stand or pass under a suspended load.
5. Employees and equipment shall be placed so as to minimize the danger of injury or damage should a pole or poles get out of control.
6. Employees engaged in handling poles shall wear suitable gloves and shall wear a shirt or jacket with the sleeves rolled down.
7. Only employees who are specifically designated and authorized shall give signals.
8. Hoisting equipment operators shall accept signals only from employees specifically designated and authorized (except a stop signal).
9. Poles shall be stored to make the pile stable, having each pile securely chocked or tied to prevent rolling.
10. Employees shall not ride pole dollies or trailers.

Loading and Transporting Poles on Trucks, Trailers, and Dollies

1. Trailer and dolly wheels shall be securely braked or blocked before landing.
2. While loading a pole, employees shall not stand between the pole pile and the loading or transporting equipment. When a pole is being rolled from the pile or from the ground to trailer or dolly, it shall be done with a line and cant hooks.
3. When poles are loaded on a flat bed, battens, bolsters, or sleepers shall be used.
4. Bolster type loads shall be loaded in a pyramidal fashion, each succeeding layer containing one less pole until pay load or a peak of one pole is reached. Each layer shall be securely nested on the one below.
5. When using bolsters with chocks, the load shall be secured with cables, slings, or other approved means.
6. Pole dollies shall not be loaded in excess of allowable weight.
7. When loading a dolly, first pole in the load shall be loaded with the top in direction of the tongue and shall extend far enough ahead of the rest of the load to permit the lashing of the tongue and attachment of the towing device to it.
8. Towing devices and chains used with pole dollies shall be of an approved type.
9. Approved type binders and bolster stakes, where provided, shall be used in securing a load to a pole dolly.
10. Employees shall not remain on a pole pile while poles are being hoisted.
11. When hauling poles of over 50 feet in length, a second bolster shall not be used on top of the first layer of poles to increase pay load.
12. The trailing end of a load of poles shall be marked by a red flag (16" X 16") during the day and a red light at night. Warning flags or lights should be placed in the center of long loads. An employee and/or vehicle shall be used for flagging/warning when necessary.

Unloading Poles from Trucks, Trailers, and Dollies

1. Dumping an entire load from a dolly or trailer is prohibited.

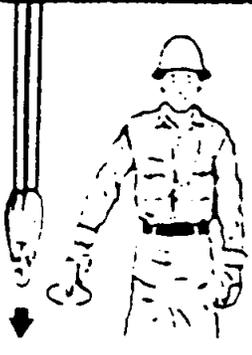
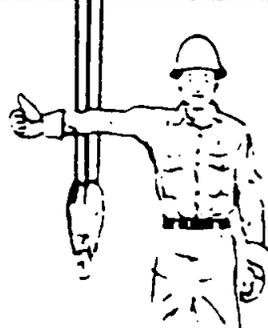
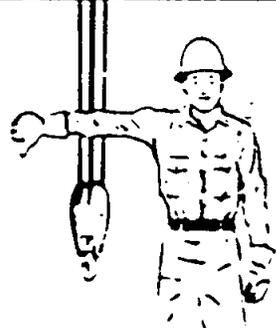
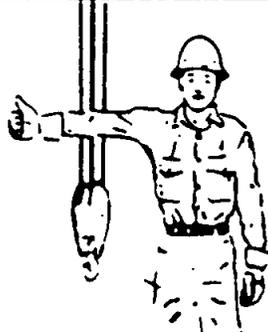
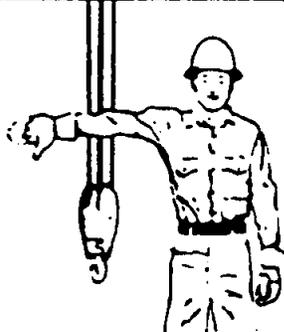
2. When rolling a pole from a load, a bull line, or lines shall be used to control its descent. Dropping poles over the side of a truck, trailer, or dolly is prohibited.
3. Employees shall not stand on the unloading side of transporting equipment while unloading a pole.
4. When unloading poles with skids or lines, the load binders and bolster stakes shall not be removed until skids or lines are in place, and the load binders shall be removed from the side opposite the unloading side when possible.
5. When unloading poles which have been secured with tie wire or straps, only the binding for the layer being unloaded shall be removed.
6. A load shall be properly secured before moving from one location to another.
7. If poles left on or near streets, highways or walkways overnight create a hazard, they shall be safeguarded by well lighted warning signs. Poles shall be so placed or blocked so that they will not roll.

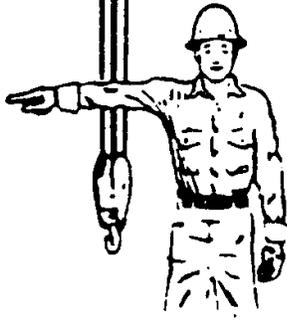
Operation Near Energized Lines or Equipment

1. Mechanical equipment shall be operated so that the minimum approach distances (section 4.2, paragraph (C)) are maintained from exposed energized lines and equipment. However, the insulated portion of an aerial lift operated by a qualified employee in the lift is exempt from this requirement.
2. A designated employee other than the equipment operator shall observe the approach distance to exposed lines and equipment and give timely warnings before the minimum approach distance required by paragraph 3.35 (A) is reached, unless the employer can demonstrate that the operator can accurately determine that the minimum approach distance is being maintained.
3. If, during operations of the mechanical equipment, the equipment could become energized, the operation shall also comply with at least one of paragraphs of this section.
 - A. The energized lines exposed to contact shall be covered with insulating protective material that will withstand the type of contact that might be made during the operation.
 - B. The equipment shall be insulated for the voltage involved. The equipment shall be positioned so that its uninsulated portions cannot approach the lines or equipment any closer than the minimum approach distances specified in section 4.2 paragraph

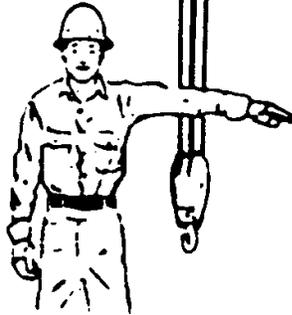
Mobile Hydraulic Cranes

Standard Hand Signals for Controlling Crane Operations

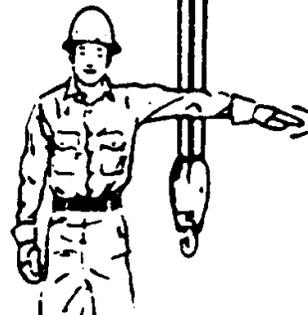
 <p>HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle</p>	 <p>LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles</p>	 <p>USE MAIN HOIST. Top fist on head, then use regular signals</p>
 <p>USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand, then use regular signals</p>	 <p>RAISE BOOM. Arm extended, fingers closed, thumb pointing upward</p>	 <p>LOWER BOOM. Arm extended, fingers closed, thumb pointing downward</p>
 <p>MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal (Hoist slowly shown as example)</p>	 <p>RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired</p>	 <p>LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired</p>



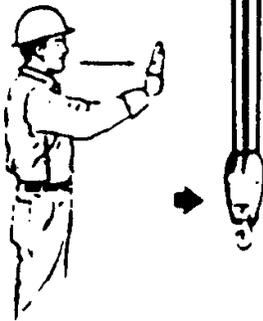
SWING. Arm extended, point with finger in direction of swing of boom



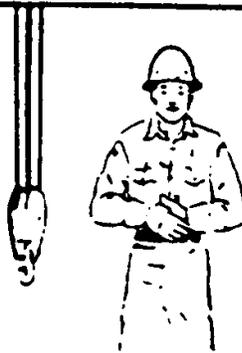
STOP. Arm extended, palm down, - hold position rigidly.



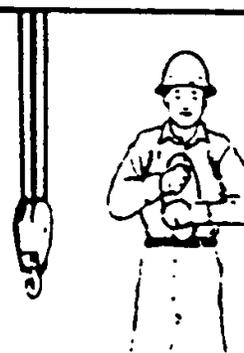
EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left



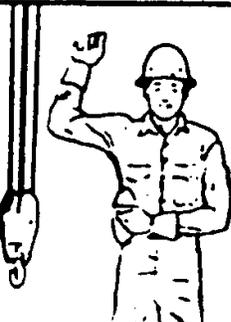
TRAVEL Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel



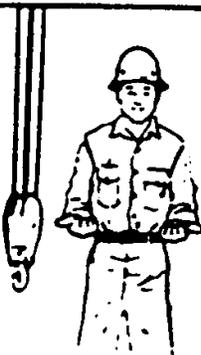
DOG EVERYTHING. Clasp hands in front of body.



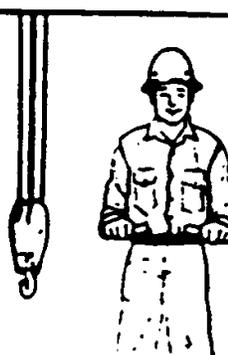
TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel forward or backward. (For land cranes only.)



TRAVEL (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)

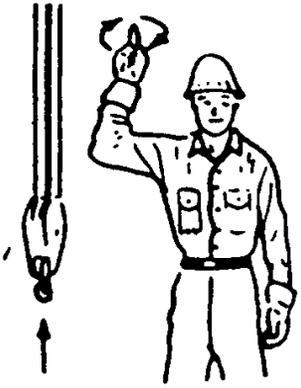
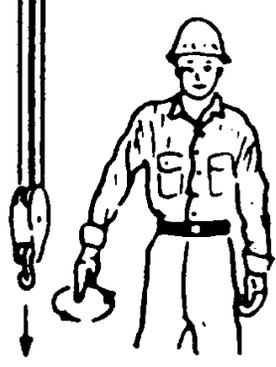
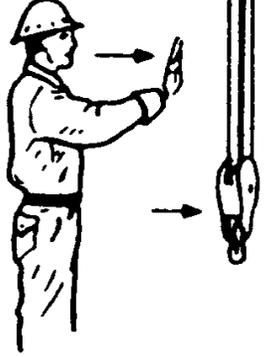
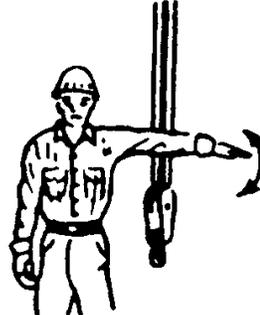
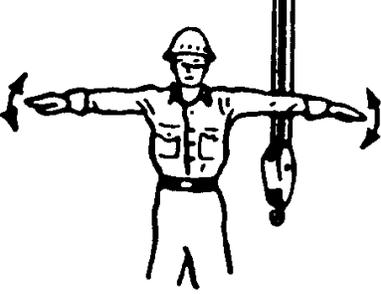
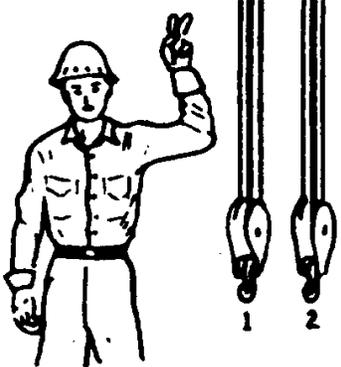
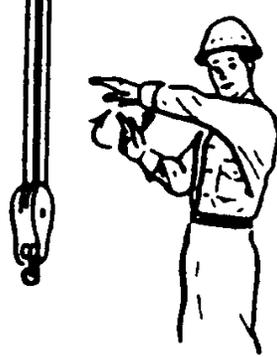


EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward



RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.

Standard Hand Signals for Controlling Overhead and Gantry Cranes

 <p>HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>	 <p>LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.</p>	 <p>BRIDGE TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>
 <p>TROLLEY TRAVEL. Palm up, fingers closed, thumb pointing in direction of motion, jork hand horizontally.</p>	 <p>STOP. Arm extended, palm down, move arm back and forth.</p>	 <p>EMERGENCY STOP. Both arms extended, palms down, move arms back and forth.</p>
 <p>MULTIPLE TROLLEYS. Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.</p>	 <p>MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)</p>	

Overhead Electrical – Distribution and Transmission

Scope:

This section shall apply to all electrical distribution and transmission personnel. Personnel from other departments engaged in distribution or transmission work shall also comply with the rules of this section. The rules set forth in this section provide minimum requirements for you and your fellow worker's safety and health. In addition, they in no way relieve the workers of their obligation to use good judgment and common sense in the performance of their duties.

General

1. Qualified Observer -Only qualified employees under continuous supervision or following instructions of a qualified worker shall be assigned to work on lines or equipment energized in excess of 50 volts; and, except in “trouble” work or emergencies involving hazards of life or property, no such employee shall be assigned to work alone. During the time an employee is doing work on any energized part of the line, the other employee shall act only as an observer for the purpose of preventing an accident.
NOTE: During the time an employee is doing work on any energized part of the line, the other employee shall act principally as an observer for the purpose of preventing an accident.
2. Touching Live Apparatus - NO employee shall touch an exposed unguarded line, wire or apparatus unless that person is insulated or isolated from other conducting surfaces or using adequate protective devices.
3. Working Distances - The following table, 4.2(C), constitutes the minimum working distance from energized conductors. (This does not prohibit climbing through energized conductors where these minimum clearances cannot be maintained, if suitable barriers and adequate protective equipment are used.)

TABLE 4.2 (C)
SAFE WORKING DISTANCES
Alternating Current - Minimum Distances
(Overhead)

Voltage Range (Phase-to-Phase) Kilovolt	Minimum Working Distance	
	P-G	P-P
2.1 through 15	2' 1"	through 2' 2"
15.1 through 36	2' 4"	through 2' 7"
through 46	2' 7"	through 2' 10"
46.1 through 72.5	3' 0"	through 3' 6"
72.1 through 121	3' 2"	through 4' 3"
138 through 145	3' 7"	through 4' 11"
161 through 169	4' 0"	through 5' 8"
230 through 242	5' 3"	through 7' 6"
345 through 362	*8' 6"	through 12' 6"
500 through 550	*11' 3"	through 18' 1"
765 to 800	*14' 11"	through 26' 0"

***NOTE:** for 345-362 kV, 500-550 kV and 765-800 kV, the minimum working distance and the minimum clear hot stick distance may be reduced, provided that such distances are not less than the shortest distance between the energized part and a grounded surface.

4. Reporting Defective Apparatus - Employees shall immediately report to their foreman or team leader any defective line, apparatus, vehicle or tool which - in their judgment - may be dangerous either to persons or property or likely to interrupt or delay service.
5. Electrical equipment and lines shall always be considered "live" unless they are tested de-energized and grounded. Before starting to work, a preliminary inspection or test shall be made to determine what conditions exist. Wires designed to operate at ground potential may sometimes become energized by reason of faulty or inadequate connections. Care shall always be exercised to handle ground wires with the same caution as is used with energized wires.
6. Current Transformer Secondary - Before working on instruments or other devices in a current transformer secondary circuit, always bridge the instrument or device with jumpers so that the circuit cannot be opened at the device. Never open a current transformer secondary circuit until it has been bridged between the current transformer and the part of the circuit to be opened

Tools, Protective Equipment

1. Rubber Protective Equipment
 - A. Rubber protective equipment shall be visually inspected prior to each day's use.
 - B. An "air" test shall be performed for high and low voltage rubber gloves prior to each day's use.
 - C. The appropriate rubber gloves shall be put on before entering the working area within which energized lines or apparatus may be reached. Gloves shall not be removed until the employee is out of reach of the energized lines or apparatus.
 - D. When not in use, rubber gloves shall be protected in protective glove bags as provided.
 - E. Rubber protective equipment shall not be used at voltages in excess of rated voltage. (See General Rule 1.53)
 - F. Rubber protective equipment shall be exchanged any time it becomes damaged or when the employee to whom it is assigned becomes suspicious of its integrity or; if the date for testing has expired.
 - G. Rubber protective equipment (gloves, blankets and jumpers) shall be examined and electrically tested at least annually or at OSHA required intervals.
2. Personal Climbing Equipment
 - A. Body belts with straps or lanyards shall be worn while working at elevated locations on poles, towers, substations or other similar structures.
 - B. Body belts and straps shall be inspected before each day to ensure they are in a safe condition. Defective equipment shall not be used.
 - C. Climbers shall not be used after the gaffs are worn or filed to less than 1 1/4" long, measured on the underside of the gaff. An approved gaff gauge shall be used for these measurements.

- D. Climbers shall be worn only when the employee is engaged in work requiring their use and shall never be worn when:
 - 1) Driving or riding in a vehicle;
 - 2) Setting or handling poles;
 - 3) Climbing ladders;
 - 4) Working on the ground;
 - 5) While on floors and roofs;
 - E. Only approved safety straps, body belts and full body harnesses shall be used.
 - F. Before climbing poles, employees shall acquaint themselves with the circuits, voltage and apparatus on the pole. The employees shall also make certain, by inspection and test, that the pole is safe both above and below the ground line.
 - G. Employees shall not work on a pole or any elevated structure without first securing themselves with a safety strap or lanyard, unless proper railing or guards are provided.
 - H. Employees shall never rely on the "click" of the keeper in the snap hook. In all cases, employees shall check to make sure that the snap hook and "D" ring are properly engaged or that the lanyard is secured before the weight of the body is placed on the strap or lanyard. Both snap hooks shall not be attached to the same "D" ring when a safety strap is in use. Snap hooks shall face away from the body when engaged.
 - I. Employees shall ascend or descend poles singly. The first person shall be in place on the pole or on the ground before the next person climbs or descends the pole.
 - J. When it becomes necessary for one person to work above the other, extreme care shall be exercised.
 - K. When raising and lowering tools and material, a hand line with a material bag attached thereto shall be used.
 - L. Wire hooks or loops shall not be used on body belts.
 - M. All employees will understand what they are to do and how to do it, by way of a "tailboard"
3. Suitable Clothing
- A. Because employees of the lines department are constantly exposed to voltages capable of producing hazardous electrical arcs and/or flames, they shall wear appropriate flame retardant or 100% cotton clothing.
 - B. A shirt or jumper with full length sleeves, rolled down and buttoned at the cuffs, shall be worn when working on wood poles or equipment to protect against injuries or under other hazardous conditions as the employee in charge shall direct.
 - C. Safety Hard Hats Shall be Worn:
 - (1) (See General Rule 1.49)
 - (2) Hard hats shall be adjusted in accordance with the manufacturer's instructions to provide the maximum protection.
 - (3) No holes, metal attachments, painting or alterations of any kind shall be made on hard hats.
 - (4) Hard hats shall be made of a non-conducting material, and shall be rated for the appropriate voltage work. See ANSI Z89.1-1986.

- D. When work is performed within reaching distance of exposed energized parts of equipment, the employer shall ensure that each employee removes or renders nonconductive all exposed conductive articles, such as key or watch chains, rings, or wrist watches or bands unless such articles do not increase the hazards associated with contact with the energized parts.
- 4. Safety eye protection shall be worn while working on any energized line or equipment where there is the potential for injury to the eyes due to flash or due to physical, chemical or other harmful agents. Safety glasses with side shields shall be worn when there is a hazard from flying objects, as in General Rules 1.50 (C).
- 5. Live-Line Tools
 - A. All live-line tools shall be cleaned and inspected before use each day. They shall be electrically tested at least every two years and, when necessary, repaired and retested.
 - B. Live-line tools shall be stored and transported in a manner which prevents mechanical damage.
 - C. Only those employees who are trained and qualified in the use of live-line tools shall perform live-line work.
 - D. Working clearance from energized conductors shall not be less than those in table 4.2 (C) of this section.

Tailboard Briefings

Tailboard briefing means "tailboard conferences", "job procedure discussions," or merely talking the job over before starting to work so that all members of the crew thoroughly understand the job to be done and the foreman's method of accomplishing it. Before starting each job, every foreman shall call the crew together and outline the proper work procedure to be followed in such a manner that the following will be accomplished.

- 1. All employees will understand the purpose of the job (what they are going to accomplish).
- 2. All employees will understand what they are to do.
- 3. All employees will understand what the other members of the crew are to do.
- 4. All employees will understand the foreman's manner of conducting the job.
- 5. All employees will understand the hazards or trouble spots involved and will know how the foreman is proposing to overcome such problems.
- 6. If other crews are involved, all employees will understand who they are and how they will be involved.
- 7. All employees will understand the work procedures involved.
- 8. All employees will be aware of special precautions.
- 9. All employees will know the energy source controls.
- 10. All employees will be aware of what personal protective equipment is required for the job.
- 11. Final questions that anyone may want to ask will be answered. (It is better and safer to answer questions than allow a misunderstanding to develop.)

12. If contractors are involved, they shall be present at the tailboard. This includes hired flaggers.
13. A review of emergency procedures to be followed.
NOTE: Additional job briefings are required if significant changes which may affect the safety of the employees occur during the course of the work.

Personal Protective Grounding of Distribution, Lines and Devices

This section covers the installation and removal of personal protective grounds on all City of Gunnison's overhead distribution lines and devices.

1. Definitions
 - (A) Working Grounds – Grounding jumpers installed between the phase conductors and system neutral.
 - (B) Personal Grounds – A cluster bar installed on the pole or structure below the work position, and a grounding jumper installed between the system neutral and the cluster bar.
 - (C) Personal Protective Grounds – Combines working grounds and personal grounds in a way that reduces the potential voltage difference at the work site (voltage across the worker) to a safe level.
 - (D) Equipotential Zone – Personal protective grounds placed at such locations and arranged in such a manner as to prevent each employee from being exposed to hazardous differences in electrical potential.

2. General Requirements

When a conductor or device that is energized, or may be energized at over 50 volts is removed from service for maintenance or construction, it shall be considered energized until it is IDENTIFIED, ISOLATED, TESTED, AND GROUNDED AS SPECIFIED IN THIS SECTION.

Lines and devices shall be grounded only after a proper clearance or permit has been issued in accordance with Section 9 "Dispatching and Clearances."

The safest way to temporarily ground overhead distribution lines and devices is to create an equipotential zone by using personal protective grounds.

Workers are best protected when personal protective grounds are installed at the work site. However, there will be situations where this is impractical or impossible. In these situations, personal protective grounds shall be installed as close to the work site as possible (within one span).

Employees working on lines and devices shall possess a working knowledge of OSHA 1910.269 (n) "Grounding for the protection of employees."

A "tailboard meeting" shall be held with ALL workers involved before beginning any job to discuss the potential hazards. When the work includes grounding of lines and devices, development of the equipotential zone shall be discussed and understood by everyone involved with the work.

Distribution lines and devices shall be grounded to the system neutral when personal protective grounding procedures are used.

NOTE: Where a system neutral is not available an approved temporary ground rod shall be used. A ground rod can be used in conjunction with above applications. Anchor rods should be considered a last resort option, even then are not recommended.

When grounding is impractical, or more hazardous than working on the lines or devices without grounds, the grounds may be omitted, provided that all work is done as if the line or device is energized. The minimum approach distances of Table 4.2 (C) shall be maintained from all ungrounded conductors and devices. (See Section 1.53(C)(1) for use of rubber gloves.) If primary phase conductors have been moved from their normal position and are lying or hanging near the ground, personal protective grounds shall be installed as close to the work site as possible, and all workers shall wear approved rubber gloves or stand on conductive mats. If the primary phase conductors are broken, personal protective grounds shall be installed on BOTH SIDES of the work location and again, all workers shall wear approved rubber gloves or stand on conductive mats.

When work is done out of an approved insulated aerial manlift, the lines and devices shall be grounded using personal protective grounds within one span of the work area. If work is done out of an uninsulated aerial manlift, the lines and devices shall be grounded using personal protective grounds and the manlift work platform shall be connected to the conductor with an approved grounding jumper. Refer to the vehicle grounding section for proper grounding of utility vehicles.

Only approved personal protective grounding equipment shall be used. Personal protective grounding equipment shall be visually inspected each day before use. This includes visually checking grounding jumpers for broken or loose fittings, and chafed or cut insulation. The grounding clamp jaws shall be clean and the cable ferrules checked to be tight before each use. Wire brush the grounding clamp jaws before each use. If any damage is found replace the equipment.

Personal protective grounds shall be installed as short, straight, and direct as practical. Grounds should be installed so that the grounding conductor does not contact the pole, arm, hardware, or equipment. If slack must be taken up, the grounding cable should be coiled with no more than ONE loop and secured.

Grounding jumpers can make violent wiping actions when energized with fault currents approaching and exceeding 20,000 A. When system fault currents exceed 15,000 A jumpers should be installed so that they will not injure workers if energized.

The ground-end clamp of the grounding cable shall always be connected to ground first and removed last. The conductor end of the ground cable shall be connected and disconnected with hot-line tools.

No part of the personal protective grounding jumpers shall be contacted when being installed or removed. Workers should not contact any portion of the personal protective grounds after they are in place.

Workers on the ground may be exposed to step and touch potentials when all types of grounding procedures are used. While work is in progress, ground personal should stay at a minimum of 10 feet from the structure being worked. If ground workers must contact the structure, approved insulated rubber gloves shall be worn or conductive mats used.

Personal protective grounds shall not be removed until all employees are clear of the lines or devices. Grounds shall be removed from the phase conductors using hot-line tools, with the last connection removed at the ground location. Personal protective grounds may be removed temporarily during testing. However, insulating equipment, rubber gloves and hot line tools shall be used to isolate all workers from the lines and devices. Refer to OSHA 1910.269 (O) "Testing and test facilities."

Stringing Adjacent To Energized Lines

1. Prior to stringing parallel to an existing energized transmission line, a competent determination shall be made to ascertain whether dangerous induced voltage buildups will occur, particularly during switching and ground fault conditions. When there is a possibility that such dangerous induced voltage may exist, the following rules shall apply, unless the line is worked as energized.
2. All pulling and tension equipment shall be isolated, insulated or effectively grounded. All equipment at an affected work site shall be bonded together to minimize differences in potential.
3. A ground shall be installed between the tensioning reel setup and the first structure in order to ground each bare conductor, sub-conductor, and overhead ground conductor during stringing operations.
4. During stringing operations, each bare conductor, sub-conductor and overhead ground conductor shall be grounded at the first structure adjacent to both the tensioning and pulling setup and in increments so that no point is more than two miles from a ground.
5. The grounds shall be left in place until conductor installation is completed.
6. Such grounds shall be removed as the last phase of aerial cleanup.
7. All the grounds shall be placed and removed with a hot stick. Rolling grounds may be placed or removed using high voltage rubber gloves.
8. A ground shall be located at each side and within ten feet of working areas where conductors, sub-conductors or overhead ground conductors are being spliced at ground level. The two ends to be spliced shall be bonded to each other. It is recommended that splicing be carried out on either an insulated platform or on a grounding mat bonded to the grounded conductors. When a grounding mat is used, it is recommended that the grounding mat be roped off and an insulated walkway provided for access to the mat.
9. Grounds may be removed as soon as the work is completed PROVIDED that the line is not left open circuited at the isolated tower at which work is being completed.

Setting Poles

1. All persons not engaged in pole setting operations shall be kept out of the work area. This includes bystanders and the public in general.
2. When setting or removing poles between or near energized conductors where danger from contact exists, the conductor shall be de-energized, covered with protective devices, or spread to minimize accidental contact. Guy lines made

- of non-conductive rope may be used to control the pole, and workers handling the butt of the pole shall wear rubber gloves whether or not cant hooks or slings are used.
3. When setting or removing poles between or near energized conductors where danger from contact exists, no one shall step on or off the truck or touch any part of the truck from the ground while the pole is being set or until it is secured in such a manner that it could not possibly come in contact with an energized line. All equipment shall be grounded and bonded to minimize potential differences, or barricade the area to limit access to hazardous areas. (See Section 3.35)
 4. When poles are being raised or lowered with mechanical equipment, all employees shall stand "in the clear."
 5. No one shall work on a pole or structure until it is fully secured in place. Poles or structures supported by winch lines, pikes or other devices shall not be climbed until secured in place.
 6. In piking poles, the pikes shall not be supported by the worker's body belt or safety strap. Cant hook or other suitable devices shall be used to prevent rotation of poles.
 7. Pike poles shall be properly set and shall not be left unattended except on orders of the employee in charge of the operation.
 8. All holes made in connection with pole setting or guying operations shall be guarded or covered.
 9. Employees shall stay "in the clear" of the revolving auger of the pole hole digger.
 10. Before moving a truck which is supporting a pole, care should be taken to see that the area over which the truck is to be moved is reasonably level and free from deep holes.
 11. The use of metallic winch lines shall not be used unless a minimum working distance can be maintained, adequate barriers erected, or the equipment covered by protective devices.

Pole Top Equipment

1. All circuits shall be operated with a switch stick or other approved device.
2. Transformer cases or other pole top apparatus shall always be treated as energized while connected to the line.
3. Where secondaries or transformers are banked or where there is a possibility of a backfeed, the transformer secondary shall be disconnected, in addition to removing the primary fuses, before any work is done on the primary side of the transformer.
4. Capacitors. Before any work is done on capacitors of any voltage the following precautions shall be observed:
 - (A) The position of the operating handle on Kyle switches shall not be depended upon to determine if an oil switch is open or closed.
 - (B) A clamp-on ampmeter reading should be made to determine if any current flow is present before opening any disconnect ahead of an oil switch on a capacitor bank.

- (C) Open the fuse cutouts, then after waiting five minutes the de-energized leads of the capacitor connectors shall be shorted by means of a temporary jumper or jumpers. After another wait of five minutes, the equipment is safe to work on. It is good practice to leave the short circuit in place until the work is finished.

NOTE: Where capacitors are installed on 230 or 460 volt secondary installations connected directly to the line without cutout or switches, the transformer bank shall be de-energized, if possible, and the same procedure shall be followed as applies to voltages up to 5000.

Aerial Lift Safe Practices

1. Refer to General Rule 1.43 of this manual.
2. General instructions;
 - (A) All employees should be aware of the location of the engaging override or bypass, (lower controls), and be familiar with their operation. The lower (override) controls must be readily accessible and operable at all times while a lineman is working aloft.
 - (B) Ground personnel must get into the habit of following the route that the lineman takes to place the work basket at working level. (This helps in determining the most efficient way to maneuver the boom if emergency lowering becomes necessary.)

Testing Poles And Structures

1. Before climbing poles, ladders, scaffolds, or other elevated structures employees shall first assure themselves that the said structure or device is strong enough to safely sustain their weight. The employee shall assess the pole or structure to be climbed by standard methods (sounding).
2. Before allowing people to work on any pole from which supporting wires or guys are to be removed, or on those on which the stress is to be changed in any way, the employee doing the work shall make sure that the pole will stand the change in stress without falling. When necessary to test the butt of the pole for soundness, the test shall be made at a point with an auger.
3. When poles to be worked on are found unsafe, or when it is not possible to test, they are to be adequately supported before work is started.

Qualified Persons

Only qualified persons shall be assigned to work on energized conductors or equipment. Persons in training who are qualified by experience and training shall be permitted to work on energized conductors or equipment while under the continuous supervision or instruction of a qualified person. No such person shall be assigned to work alone on energized equipment except for replacing fuses or operating switches or performing other operations which do not require the person to work on energized high voltage conductors or parts of equipment.

Fall Protection

1. The purpose of this plan is to address fall protection when working at elevated locations more than four feet (1.2m) above the ground on poles, towers and in aerial devices, and set limits on fall distance's, and training requirements needed to be classified as qualified. It will also address the proper equipment needed while performing certain tasks set-forth in this document.
2. Safe Work Practices
 - A. All fall protection equipment shall be inspected before use each day to determine that the equipment is in safe working condition. Defective equipment shall not be used.
 - B. All equipment shall be used in a way to prevent cuts or abrasion to it.
 - C. Fall protection equipment shall be used at locations more than four feet (1.2 m) above the ground. Fall protection equipment is not required to be used by a qualified employee climbing or changing locations, unless conditions warrant its use, such as ice, high winds or contaminants on the structure that could cause the employee to lose their grip or footing.
 - D. Positioning equipment, consisting of body belt a and lanyard may be used by qualified employees on poles, towers or similar structures if other fall protection has not been provided. When using positioning equipment the anchorage must be able to support and limit a potential fall to two feet.
 - E. While working from any aerial device a full body harness shall be worn and the shock absorbing lanyard shall be attached to the approved anchorage point on the boom or basket. No employee shall attach their lanyard to adjacent poles, structures or equipment while working from an aerial device.

ELECTRIC UNDERGROUND

Scope and Purpose

The safety rules in this section are those which apply specifically to the construction and operation work in the Electric Underground Section. The safety rules in the General Section, Overhead Line, Electric Substation and the rules in this section are of equal importance and effect.

Planning and Job Briefing

In all underground work, planning and job briefing are essential to ensure the safety of personnel and protection of equipment. Please refer to the rules in Section 4 , Rule 4, Tailboard Briefing.

Manholes

The term "manhole" applies to all manholes, vaults and similar enclosed spaces. There are many potential hazards connected with manholes. Some of these hazards such as "dead air", sewer gas, explosive atmospheres, etc., are common to all manholes. Other hazards such as steam, burns, electrical contact, smoke, natural gas, etc., are dependent upon department use of the manhole. The rules in this section are broad, covering all company manholes.

Safety Precautions While Working In Enclosed Areas

Work performed in substations, vaults, structures, transformers, cubicles, switches, fuses, capacitors or any other type of enclosures at the voltages shown on Table 4.2(C) of Section 4 will be done maintaining the minimum working distances when any energized conductor or devices are not covered or a barrier is not used to protect the employee from accidental contact. Work requiring the use of wire, pipe, buss, metal or other conductive material in lengths that could cause accidental contact within or beyond the minimum safe working distance will require barriers and/or other preventive measures to protect the employees while working in the area.

Energized Manholes, Vaults, Pull Boxes and Splice Boxes

Only qualified employees may perform work in an energized manhole, vault, splice box or UGM.

While working energized splice boxes or pull boxes and it is deemed to be unsafe to work it with the number of employees present, they have two options:

1) call for additional employees, or 2) de-energize the box to be worked.

NOTE: The above requirements do not prevent a single qualified employee from entering, for brief periods of time, where energized cables or equipment are in service for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely.

Working In Manholes, Vaults and Handholes

1. Appropriate warning signs shall be promptly placed when covers of manholes, handholes or vaults are removed. An appropriate warning sign depends upon the nature and location of hazards involved.

2. When work is to be performed in a manhole or unvented vault:
Enclosed Space Entry Procedure shall be followed while working in manholes or unvented vaults.
NOTE: Other considerations which are not specifically covered in Enclosed Space Entry Procedures might be:
 - A. Checking for overheated cables
 - B. The manhole cover shall be moved entirely clear of the opening. It shall be placed so as not to constitute a tripping or striking hazard.
 - C. To prevent traffic over a manhole while employees are working, a company vehicle shall be parked in the traffic lane with brakes set.
 - D. A fire extinguisher must be kept readily available whenever an employee is working in a manhole.
 - E. Electric motors, heaters, fans, and lighting equipment must be approved by the supervisor or some person designated by the supervisor, before such equipment is used in manholes.
 - F. When replacing the manhole cover, all dirt and trash shall be removed from the rim and the cover, and so placed as to fit properly in its seat.
 - G. Working in manholes with the cover or grating on is prohibited.

Tools and Material

Tools and material shall not be placed near the edge of manholes or where they may fall or come into contact with energized equipment.

Conductors

When working on conductors in energized primary locations, such as manholes, splice boxes, and vaults where such conductors may not be fused, the automatic reclosing feature of circuit interrupting devices shall be made inoperative before commencing work.

Rubber Gloves

1. Employees who may be called upon to touch or otherwise make electrical contact with another employee working on energized conductors or equipment, shall wear the same protective equipment as those doing the energized work.
2. Rubber gloves shall be worn when handling or guiding wire rope or cables where there is a possibility of contact with energized conductors or equipment.
3. See Section 4, Rule 4.3A, Rubber Protective Equipment.

Eye Protections

Safety glasses or face shields shall be worn by employees whenever any operation presents the potential for eye or facial injury from electrical flash or from physical, or chemical agents.

Reels

1. Adequate help shall be used in handling cable reels. Power equipment shall be used wherever possible.

2. Cable reels shall not be left unattended unless they are fully secured.

Identification

1. All cables and equipment shall be labeled with tags or other suitable means of identification.
2. Before any work is started in a manhole, all cables and equipment shall be positively identified by the person in charge and the crew so informed.

Energized Cables

1. All cables and equipment shall be considered energized and worked with adequate protective equipment until they have been proven de-energized.
2. Extreme care shall be taken if a cable must be moved, bent or otherwise worked while energized.
3. Energized cables may only be moved when it is determined by the person in charge safe to do so.
4. When testing, cutting, or splicing a cable or other equipment energized at 50 volts or more, rubber gloves shall be worn unless the worker is insulated, isolated, or a zone of equipotential is provided. All adjacent conductors, equipment and grounds with which the possibility of contact exists shall be covered with rubber protective equipment, barriers or barricades.
5. Suitable eye protection shall be worn where the possibility of an arc or flash exists, as in making a joint or splice of a dead conductor to an energized conductor.

Pulling Cables

1. When pulling cable, equipment shall be set up to provide maximum safety for employees and the public.
2. Wire ropes shall not be used to pull a cable into a duct already occupied by an energized conductor.
3. When pulling cables in the vicinity of energized conductors or equipment, care **MUST** be taken to use barriers and rubber protective equipment to prevent contacts. If there is any possibility of contact, all employees handling or guiding the cable or wire rope shall wear rubber gloves. All other persons shall be kept clear of the work.

Transformers

1. Transformers shall not be energized unless properly grounded to the system neutral.
2. Oil samples from energized transformers shall be collected only by a qualified person, using proper procedures.

Qualified Person

Only qualified persons shall be assigned to work on energized conductors or equipment. Persons in training who are qualified by experience and training shall be permitted to work on energized conductors or equipment while under the continuous supervision or instruction of a qualified person. No such person shall be assigned to

work alone on energized equipment except for replacing fuses or operating switches or performing other operations which do not require the person to work on energized high voltage conductors or parts of equipment.

SUBSTATIONS

Scope and Purpose

1. These rules apply to all electric substations, switchyard, and comparable electric installations.
2. In addition to compliance with these rules, all other rules pertinent to substations shall be followed, i.e. rules regarding aerial lifts, cranes, overhead work, and general rules.

Safety Precautions While Working In Enclosed Areas

Work performed in substations, vaults, structures, transformers, cubicles, switches, fuses, capacitors or any other type of enclosures at the voltages shown on Table 4.2(C) of Section 4 will be done maintaining the minimum working distances when any energized conductor or devices are not covered by a barrier protecting the employee from accidental contact. Work requiring the existence of any wire, pipe, buss, metal or other conductive material in lengths that could cause accidental contact within or beyond the minimum safe working distance will require barriers and/or other preventive measures to protect the employees while working in the area.

Qualified Persons

Only qualified persons shall be assigned to work on energized conductors or equipment. Persons in training who are qualified by experience and training shall be permitted to work on energized conductors or equipment while under the continuous supervision or instruction of a qualified person. No such person shall be assigned to work alone on energized equipment except for replacing fuses or operating switches or performing other operations which do not require the person to work on energized high voltage conductors or parts of equipment.

Working on Station Equipment

1. All employees entering a station shall immediately report their presence and purpose to the system dispatcher.
2. No person shall work on any station apparatus without first obtaining proper authorization.

When any testing, switching, or other work which may affect operations is to be done in an unattended station, the dispatcher shall be notified before the work is started.

Instructing Workers Relative to Condition Of Lines Or Equipment

The employee in charge shall make sure any statements or orders made by him relative to the condition or clearance of lines or equipment are understood and acknowledged by every person concerned before work is started. If the condition or status of lines or equipment is changed, the supervisor shall see that these persons acknowledge the notice thereof. Unusually hazardous jobs shall not be started without first consulting the supervisor.

Safe Working Distances

1. Safe working distances shall be maintained between workers and all exposed energized parts, as in Section 4, Rule 4.2(C).
2. If energized apparatus is being directly worked on, approved insulated tools or devices shall be used and approved protective guards or barriers shall be installed between the employee and the adjacent energized parts.

Grounding

1. This section covers the installation and removal of personal protective grounds at all City of Gunnison's Substations.
2. Definitions
 - (A) Working Grounds - Grounding jumpers installed between the phase conductors and the substation ground mat.
 - (B) Substation Ground Mat - acts as the cluster bar for substation personal protective grounding.
 - (C) Equipotential Zone - Working grounds placed at such locations and arranged in such a manner as to prevent each employee from being exposed to hazardous differences in electrical potential.

3. General Requirements

When a conductor or device that is energized, or may be energized, at over 50 volts is removed from service for operation, maintenance or construction, it shall be considered energized until it is identified, isolated, tested, and grounded as specified in this section.

Lines and devices shall be grounded only after a proper clearance or permit has been issued as specified in Section 9 "Dispatching and Clearances."

The safest way to temporarily ground substation lines and devices is to create an equipotential zone by using working grounds and the substation ground mat.

Employees working on lines and devices shall possess a working knowledge of OSHA 1910.269 (n) "Grounding for the protection of employees."

A "tailboard meeting" shall be held with all workers involved before beginning any job to discuss the potential hazards. When the work includes grounding of lines and devices, development of the equipotential zone shall be discussed and understood by everyone involved with the work.

When grounding is impractical, or more hazardous than working on the lines or devices without grounds, the grounds may be omitted, provided that all work is done as if the line or device is energized. The minimum approach distances of Table 4.2 (c) shall be maintained from all ungrounded conductors and devices.

When work is done out of an approved insulated aerial manlift, the lines and devices shall be grounded using working grounds to the ground mat. If work is done out of an un-insulated aerial manlift, the lines and devices shall be grounded using personal protective grounds and the manlift shall be connected to the substation ground mat at the same location as the working

grounds. Refer to the vehicle grounding section for proper grounding of utility vehicles.

Only approved grounding equipment shall be used. Working grounds shall be visually inspected each day before use. This includes visually checking grounding jumpers for broken or loose fittings, and chafed or cut insulation.

The grounding clamp jaws shall be clean and the cable ferrules checked tight before each use. Wire brush the grounding clamp jaws with inhibitor before each use. If any damage is found, replace the equipment.

Personal protective grounds shall be installed as short, straight, and direct as practical. Grounds should be installed so that the grounding conductor does not contact the structure, hardware, or equipment. If slack must be taken up, the grounding cable should be coiled with no more than one loop and secured.

Grounding jumpers can make violent wiping actions when energized with fault currents approaching and exceeding 20,000 A. When system fault currents exceed 15,000 A jumpers should be installed so that they will not injure workers if energized.

The ground-end clamp of the grounding cable shall always be connected first to the ground mat and removed last. The conductor end of the ground cable shall be connected and disconnected with hot-line tools.

No part of the working grounds shall be contacted when being installed or removed. Workers should not contact any portion of the working grounds after they are in place.

Working grounds shall not be removed until all employees are clear of the lines or devices. Grounds shall be removed from the phase conductors using hot-line tools, with the last connection removed at the ground mat.

Working grounds may be removed temporarily during testing. The use of test equipment may require removal of grounds, and can charge conductors and equipment. After testing, grounds shall be reapplied before coming in contact with the conductors or equipment. When grounds are removed for testing insulating equipment, rubber gloves, or hot line tools shall be used to isolate all workers from the lines and devices. Refer to OSHA 1910.269 (O) "Testing And Test Facilities."

4. Installing Working Grounds to All Equipment

- A. Identify and isolate the device. Obtain a visible opening on the source (and load side if possible) of the device.
- B. Obtain a clearance as described in Section 9.
- C. Use an approved voltage detector to test the device to be sure it is de-energized.
- D. Wire brush the ground mat conductor, at the grounding location. Wire brush the conductor, bus, or pipe using a wire brush attached to an insulated tool at the location ground clamps are to be installed.
- E. Install working grounds from the station ground mat to the phase conductors or bus using hot line tools. Grounds shall be installed on both sides of the substation equipment on which work is to be

performed. Install approved barriers if personnel will be working within the minimum approach distances of Table 4.2 (C).

The grounding method described above provides an equipotential zone at the work site.

- F. Remove working grounds after the work is complete in the reverse order.
5. Installing Working Grounds on Capacitor Banks.
- A. Identify and isolate the bank. Obtain a visible opening on the source side.
 - B. Where work is to be performed on the capacitor switch:
 - 1) Use an approved voltage detector to test the device to be sure it is de-energized.
 - 2) Verify that the capacitor ground switch is closed and install grounds on the load side of the switch.
 - 3) Install grounds on the source side, and barriers as required.
6. Where work is to be performed on the capacitor bank fence, verify that the capacitor switch is closed.

Where work is to be performed on individual capacitor units:

- A. Use an approved voltage detector to test the device to be sure it is de-energized.
 - B. Verify that the capacitor ground switch is closed and install grounds on the load side of the switch.
 - C. Identify and ground each isolated can with an approved working ground.
7. Where Work is to be performed on Circuit Breakers:
Identify and isolate the source and load side. Obtain a visible opening on the source and load side.
Use an approved voltage detector to test the device to be sure it is de-energized.
Wire brush the ground mat conductor, at the grounding location.
Ground both sides of the breaker.
8. Where Work is to be performed on Transformers:
Grounds must be applied between the transformer and its high-side protective device. Do not ground through fuses, transrupters, breakers, and other types of protection.

Switching In Substations

- 1. Work shall not be performed on station apparatus until apparatus is cleared for work and clearance has been issued in a manner prescribed in the Dispatching and Clearances Section.
- 2. Before a clearance is issued on any station apparatus, the dispatcher or other qualified persons shall make all controls, including all feedback circuits from potential transformers, non-operative and determine that the equipment is cleared for work.

3. Before beginning work on any equipment or structure at any existing station, the employee in charge of the work shall see that all men in the crew are familiar with the status of the equipment; what part, if any, is energized; location of grounds; what the limits of the working spaces are; and what open switches disconnect the equipment from the source of supply. If, for any reason, there is an interruption in the work where the workers leave the job (such as stopping for lunch) before work is resumed, the same formality of checking and making people familiar with conditions shall be followed as at the beginning of the job.
4. If the status of equipment on which a clearance is held is to be changed by switching, the clearances shall first be released and then after switching is completed, new clearances shall be obtained in accordance with the rules in the Dispatching and Clearances Section.
5. When it is necessary to do any disconnect switching in an energized structure where men are working, the dispatcher will report to the person or persons holding clearances in the structure who, in turn, will call the workers down out of the structure until the switching has been completed, after which all men will recheck the status of the structure, lines and equipment before resuming work.
6. All transmitted switching orders shall be written down and read back, to be certain the instructions are understood. Except in emergencies, all switching MUST be done following a written procedure. The person taking clearance and person doing the switching MUST check the written procedure to see that it is correct before starting the switching.
7. All switching in substations shall be performed by a qualified person, in the level of detail and sequence as ordered by the issuing dispatcher, and performed in the manner prescribed in the Dispatching and Clearances Section.
8. Care must be taken to properly identify all switches before opening or closing.
9. The person who is to accept a clearance to work on parts in any substation shall personally check the switching.

Suitable Clothing

1. While performing normal operational work or construction related activities in Substations, minimal clothing requirements include a shirt (or T-shirt) with sleeves, long pants (no shorts), sturdy work boots, and a hard hat. Safety glasses shall also be worn when conditions or activities warrant, (i.e. drilling, using compressed air, aerosol chemical).

Working Upon De-Energized Conductors and Equipment

1. Clearances are required on conductors or equipment normally operated at voltages in excess of 600 volts. They shall be obtained by the person directly in charge of the work to be performed. The person directly in charge of the work shall be responsible for determining that the conductors or equipment are disconnected from all sources of supply.

2. After authorized persons have been notified that such conductors or equipment are cleared for work or the proper clearance has been obtained, tests shall be made to determine that conductors or equipment are de-energized before work is started.
3. Where the working hazard would be increased by the application of grounds, they need not be applied if the supervisor approves this action.

Qualified Observer

1. No employee shall perform work or take any conducting object within the area where there exists a hazard of contact with energized conductors by reason of the work being done, unless directly under the observation of a qualified electrical worker.
2. No material or tools of any sort shall be carried on the shoulder when working around energized equipment. Long material, including lumber, shall be carried in a horizontal position. Caution shall be exercised to prevent any material or tools from accidentally connecting energized conductors or equipment.
3. If the team leader or his representative in charge shall determine a job to be hazardous because of proximity to energized equipment and shall decide that an observer is necessary to reduce such hazard and prevent accidents, he shall designate a qualified worker.
 - (A) The qualified worker shall be thoroughly instructed and familiarized with all specific related hazards.
 - (B) The qualified worker shall give the people under observation undivided attention and allow no distraction to remove their attention from the workers.
 - (C) The qualified worker shall give warning when workers are approaching energized parts or other hazards and shall repeat this warning when the workers are near energized parts as often as is necessary to keep them constantly aware of the hazard.
 - (D) Additional observers as necessary shall be used where the nature and extent of the work at any one location is such that the observer cannot adequately watch the movement of all workers in hazardous areas.
 - (E) Workers shall first notify the observer before changing from one location to another, and shall designate the route to be taken to new location.
 - (F) The qualified worker shall not assist the others in any way while acting as observer.

Station Switching Orders

1. All transmitted switching orders used in connection with switching at stations shall be written on the proper form.
2. When issuing switching orders, the dispatcher shall state in detail and in proper sequence the switching to be performed and shall require the person taking the order to repeat the order word for word.

Working On Energized Disconnect Switches

Work shall not be done on any open disconnect devices of 5 kV or more while one side is energized, unless minimum clearances are maintained and/or suitable barriers are installed.

Visitors

Visitor or unqualified persons shall be accompanied by a qualified employee in substations and around company properties where life, service, or property might be endangered.

Lightening Arresters and Capacitors

Employees shall not work on lightning arresters or capacitors until they have been effectively discharged to ground.

Rubber Protective Equipment

1. Rubber gloves shall be inspected for corona cracks and bruises and given the roll and air test at least once each day while in use, at the beginning of the work period and at any other time when their condition is in doubt.
2. Rubber goods shall be periodically submitted for tests as required.
3. Rubber protective equipment shall be used in accordance with Section 4 of this manual as applicable.

Proper Designations Required

Disconnect switches, switchboard controls, relays, knife switches, and all equipment in stations which require operation or maintenance must be plainly designated by name, number, or other suitable means to properly identify such equipment.

Locking Stations and Enclosures

All stations and gates to switch structures containing energized high voltage equipment shall be kept closed and locked at all times, except when a qualified employee has such station or structure under observation.

Unqualified Electrical Workers

Unqualified workers that must enter substations for any purpose must be accompanied by a qualified Nevada Power Company employee.

POWER SYSTEM SWITCHING PROCEDURE

Please refer to "POWER SYSTEM SWITCHING PROCEDURE" document located in each substation control building and Electrical Supervisor's office.

METERING

Qualified Persons

If a qualified worker determines a job to be unsafe for one person working alone, the worker shall contact the team leader for instructions on obtaining assistance.

Meter Shop, General

1. The meter shop should be kept clean and orderly with everything in its properly designated place.

2. Safety guards should be used as intended. Never make inoperative, even momentarily, any safeguards provided for moving machinery, exposed live parts, insulated testing equipment, etc.
3. A good quality work shoe or boot is required. Safety shoes are recommended when danger of foot injury is present.
4. Suitable protection for the hands such as leather, chemical, or rubber gloves shall be used when necessary.
5. When it is necessary to keep flammable material on hand, store it in safety cans and in accordance with safety regulations. Keep junk metal parts, broken glass and rags in containers.
6. Test circuits must be disconnected when connecting and disconnecting meters and equipment. Do not over-fuse test circuits.
7. Lock meters securely in position during testing to prevent their falling and causing personal injury. Care must be exercised in removing and replacing glass covers to prevent injury from broken glass.
8. Eye protection, FR shirts and appropriate gloves SHALL be worn when working on energized equipment.
9. If available, socket meter installing device should be used when installing socket-type meters where difficulty is experienced. This will act as a safeguard against cuts in case the glass cover should break while the meter is being pushed into the socket. Protective gloves should be worn while installing socket-type meters.

Meter Installation and Testing Procedures

1. When maintenance or work such as changing transformers or removing blocks, sockets, etc. is being performed, the service should be de-energized, tested de-energized and grounded whenever possible before work is started.
2. Breaking load by means of removing the meter from the circuit should be avoided. The proper procedure is to pull switches or bypass the meter with jumpers.
3. A suitable potential and resistance testing device should be used when installing, setting or connecting meters in order to determine that connections are correctly made in the mounting device.
 4. When connecting any wires, jumpers or test leads, the free end shall always be in the clear. The best procedure is to snap or strap the free end to a safe spot or have it held by another person who might be assisting with the work. The free end or jumper shall not be connected without first testing with a suitable device to the point where it is proposed to make the connection, thereby insuring the correct polarity. Checking for electrical potential shall never be done by using fingers.
5. If it is necessary to have connections made or handled where opposite polarities are close and uninsulated, temporary insulating barriers should be used if it is impractical to de-energize the equipment.
6. When working on three-phase installation, it is imperative that phase rotation be maintained. Reversal of phase rotation can result in serious damage.

7. All temporary connections should be made securely to prevent them from either being pulled off or from dropping. Care should be taken that all wires, jumpers, test leads, instruments or other testing equipment are placed in such a manner that the person performing the work will neither bump into nor trip over the equipment.
8. Before work is begun on an instrument or other device in a current transformer secondary circuit the device should always be bridged with jumpers to prevent accidental opening of the transformer secondary circuit which could result in dangerous voltages.
9. Before jumpers are removed, careful inspection should be made to make certain all the customer's connections have been returned to normal position and are tight; otherwise, the jumpers may be disconnected under load, resulting in a flash at terminals. This could result in a possible interruption to the customer's service and perhaps cause personal injury.

Meter Handling and Storing Of Meter Equipment

1. Stacking of equipment for temporary storage or during handling should be done carefully, as too great a height may cause containers to collapse due to weight or imbalance resulting in possible injury to employees or damage to equipment. Creating obstructions to the view or the passageways shall be avoided.
2. Equipment should be unpacked with extreme care. Much attention should be focused on the possible presence of exposed nails, broken glass or other sharp objects which constitute a hazard. The wearing of leather gloves can prevent injury.

Primary Metering

1. A primary meter is generally referred to as PME, or Primary Metering Equipment. This includes current and potential transformers, special mounting bracket, secondary cable, conduit, conduit fittings, enclosures for transformers or meters, and wire jumpers used in making up the primary meter in the line. Lightning arresters may or may not be included. Fuses for the meter are not considered as part of PME. Primary metering may be both on the interior or exterior of our customer's structure, in switch gear, in enclosures on a pole, on the pole top, or in substations.
2. A system neutral shall be made available for grounding purposes when at all possible.

Maintenance of PME

1. When testing, inspecting, or maintaining PME, always visually inspect PME for any indication of trouble that may have occurred.
2. Treat the equipment as "live" if the visual inspection ascertained the following: Corroded, burned, annealed, broken, or cut ground wires or connections; broken or blown lighting arresters or their jumpers; broken or burned "live-line" jumper wires; smoked, burned, or damaged meters or their enclosures; energized conductors touching any piece of the equipment; broken cracked or burned insulators; broken, burned, or smoked current or potential

transformers; baked-out grounds where the ground wire enters the ground; or a phaser indicates the equipment is hot.

3. All PME will be de-energized and tested de-energized when possible. Insulated protective equipment shall be used when working on all equipment attached to the high side of the potential and to the current transformers when PME is energized. This includes short circuiting and de-short circuiting the current transformers.
4. Only qualified personnel will handle PME equipment.

Qualified Persons

Only qualified persons shall be assigned to work on energized conductors or equipment. Persons in training who are qualified by experience and training shall be permitted to work on energized conductors or equipment while under the continuous supervision or instruction of a qualified person. No such person shall be assigned to work alone on energized equipment except for replacing fuses or operating switches or performing other operations which do not require the person to work on energized high voltage conductors or parts of equipment.

