



Safety Handbook



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Section 1 – Introduction

Our Vision

To be the best customer focused water purveyor

Our Mission

- We will always provide high quality water at a reasonable value
- We pledge to operate in a cost efficient, safe and secure manner
- We will provide open communication and education on all aspects of our region's precious resources
- We anticipate and plan for future customer needs through cooperative relationships within the community and with all stakeholders

Welcome to Truckee Meadows Water Authority (TMWA). The skills and talents you bring to TMWA are vital to the company's ability to meet its mission statement and the needs of its customers.

One of the keys to accomplishing this is to ensure the personal safety and well-being of each TMWA employee through the prevention of occupational injuries and illnesses. To the greatest degree possible, TMWA seeks to ensure that we maintain a safe and healthy working environment. Remember – **There is no job so important, nor any service so urgent, that we cannot take time to work safely!**

This Safety Handbook is intended for all employees and has been developed to provide employees with general rules for safe working procedures. It is recognized that the publication of this handbook alone will not ensure a safe work environment. That will be accomplished only through the cooperative efforts of supervisors and employees working together to continuously promote safety awareness and safe work practices.

This handbook was revised in cooperation with the TMWA Safety Committee. Due to the tremendous variety of operations performed by TMWA employees within varying environments, the Committee did not attempt to address every possible work situation that an employee might encounter. Further and more detailed information can be found in the TMWA Administrative Instructions, on the Safety section of the Intranet or by contacting the Safety Officer.

Section 2 – Definitions

CDL – Commercial Driver’s License

Company Equipment – Any items used by an employee and owned by Truckee Meadows Water Authority. These items include but are not limited to hand tools, power tools, personal protective equipment, computers, telephones, etc.

Company Facility – Any Water Treatment Plant, Well, Reservoir, Pump Station, Regulator, Office Building, Generating Plant, Flume, Ditch, Warehouse, Storage Building, or site owned and/or operated by the Truckee Meadows Water Authority

Company Vehicles – Any truck, automobile, snowmobile, backhoe, trailer or boat owned by Truckee Meadows Water Authority.

Competent Person – A competent person is someone who has received approved training and through experience is capable of ensuring a task is performed safely.

Competent Person in Charge – The person who through training 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.

dB_A – Unit used to measure the intensity of sound.

Employee – Any individual who is employed by Truckee Meadows Water Authority as either full time, part time, temporary or a contract employee, and reports to any Truckee Meadows Water Authority Foreman, Project Manager, Supervisor, Manager, or senior employee, and who is paid directly by Truckee Meadows Water Authority.

Hazardous Materials Information System (HMIS) – A labeling system used on containers which contain hazardous materials. This system is used for all non-portable containers used at Truckee Meadows Water Authority.

Material Safety Data Sheets (MSDS) – An informational document meant to provide users of products that contain hazardous substances with information on safe handling, storage and usage of that product and emergency information such as first aid information.

Office Area – Any area in a company facility where administrative, clerical, engineering, planning, or system monitoring work is conducted. These areas are limited to the Capital Blvd Office, Control Rooms at Glendale and Chalk Bluff Offices, all facility lunch rooms and conference rooms, and the office areas at Mogul Office.

Personal Protective Equipment (PPE) – Any device or article of clothing which is designed to protect employees against hazards in the environment. PPE is usually worn by the individual and may include, but not limited to, glasses, shoes, hard hats, gloves, coats, hearing protection etc.

Parts per Million (ppm) – A measure of the concentration of a particular compound in a given solution. A ppm is usually considered the concentration, in pounds, of a compound in a million pounds of solution.

Tons per Square Foot (tsf) – The pressure which can be exerted on a square foot of compressed soil to determine how much weight the soil will support.

Section 3 – General Rules for All Employees

3.01 SCOPE

Safety is everyone's concern. The accident prevention rules set forth herein are for the purpose of preventing accidents to persons and property. EVERY EMPLOYEE OF THE COMPANY shall comply with these rules under every circumstance where they are applicable. Violation of these rules shall lead to disciplinary action, up to and including termination.

When an employee of one department is assigned to work on equipment or facilities subject to the jurisdiction of another department, such employees shall follow the rules of the latter department.

Any reference to the male gender in this manual shall also be interpreted to include the female gender.

3.02 AMENDMENTS

Revisions or amendments to this document will be made from time to time as may be dictated by circumstances and shall be effective on the date of their issuance.

3.03 APPLICATION

These rules represent minimum requirements and are only intended to cover average conditions. Since it is impractical to cover all conditions and emergencies, the earnest cooperation of all employees with their supervisors is requested in meeting conditions not provided for within these rules.

3.04 INTERPRETATION OF HAZARDOUS WORK CONDITIONS

If an employee is called upon to perform work, which they consider hazardous and/or to be lacking proper protection, they should bring the matter to the attention of their supervisor before commencing work. Interpretations of the hazardous conditions rest with the supervisor. However, if questions still arise, appeals may be made to the Safety Officer.

These rules shall be strictly interpreted to bring about maximum compliance and safe conduct and shall take precedence over any conflicting instructions. However, lawful and applicable governmental regulations, which may be more stringent than these rules, shall control.

3.05 TAILBOARD BRIEFING

Tailboard briefing refers to tailboard conferences, defined as “job procedure discussion” in which the details of a job are discussed before the work is started. The goal of the brief discussion is to ensure that all supervisors and members of the crew thoroughly understand the job to be done and the method through which it will be accomplished.

Before starting each day or each new job, if significant changes in working conditions have occurred, each Foreman shall call their crew together for a “Tailboard Briefing” to outline the proper work procedure to be followed in such a manner that the following will be accomplished:

- Each employee shall understand the purpose of the job
- (What is going to be accomplished?)
- Each employee shall understand their role
- (What am I doing on this job?)
- Each employee shall understand other crew members roles
- (What are the other crew members doing?)

- Each employee shall understand the Foreman's manner of carrying out the job
- Each employee shall understand the hazards or trouble spots involved with the job and will know how the Foreman proposes to overcome such problems. This includes the inclusion of 'Personal Protective Equipment' that is required
- If any significant changes occur which might affect the safety of the crew another "Tailboard Briefing" shall be conducted

3.06 REPORTING HAZARDOUS CONDITIONS

If an employee observes a hazardous condition, they should correct it immediately. Regardless of the department in which such condition exists, the employee must promptly report the condition to their Immediate Supervisor, including the nature of the hazard and any steps taken to eliminate the hazard. If the problem cannot be corrected immediately, the employee is responsible for placing warning devices and barriers in the area.

An employee who receives a report of any hazardous emergency condition shall obtain the informant's name, the exact location of the hazardous emergency, and the nature of the hazardous emergency. The employee should then immediately take the appropriate steps to correct the condition and report it to their Immediate Supervisor.

3.07 TOBACCO USAGE

Tobacco usage is prohibited at TMWA facilities except in designated areas. Tobacco use and smoking is prohibited in all TMWA vehicles.

3.08 FOOD AND BEVERAGES

Consumption of food and beverages should be confined to designated areas. Storage of food or beverages or consumption of food or beverages is prohibited in the following areas:

- All laboratory areas at Glendale and Chalk Bluff
- Chemical storage areas
- Pilot Plant
- Mechanics Shops at Glendale and Chalk Bluff (except for office areas)
- While driving a company vehicle

Section 4 – Signs, Guards & Barriers

4.01 INTRODUCTION

Signs, tags, or barriers are used to convey information concerning an area or equipment. Signs, tags or barriers may be used to identify equipment, containers, or to provide warning to employees, visitors, guests, or contractors. This section outlines signs, tags and barriers that are used to convey specific warnings.

4.02 HAZARDOUS MATERIALS CONTAINERS

All containers (regardless of size) which are used to store substances that are acidic, caustic, toxic, reactive or explosive shall be identified using signs or labels. All signs or labels will conform to the Hazardous Materials Information System (HMIS) standards. Each label will contain the following information:

- Name of Product (as listed on the MSDS)
- Relative Health Hazard
- Relative Fire Hazard
- Relative Stability
- Target Organ warnings

These signs and/or labels can be obtained in the Glendale laboratory. In the instance that a label is not available write the required information on the container.

Examples of containers which require labeling with a Hazardous Materials Information System sign or label include but are not limited to:

- Chemical Storage Tanks
- Laboratory reagent bottles
- Portable gasoline cans
- Any manufacturer containers which is not already labeled or whose label is illegible

Any company vehicle which transports chlorine gas in any quantity shall be required to be placarded with black and white placards designated for toxic gases, specifically the “Chlorine Gas” placard. Placards should be placed on all four sides of the vehicle. The driver of the vehicle must have a current CDL with a hazardous materials endorsement.

4.03 TAGS

The following three types of tags are used at TMWA:

- *Red tags*: Indicate that the equipment so tagged must not be energized under any conditions. Only the person who hung the red tag or an authorized company representative may remove this tag.
- *Blue tags*: Indicate that the person who hung the tag may operate the equipment so tagged. This tag indicates that equipment may be damaged if it is energized. Only the person who hung this tag or a duly authorized company representative may remove this tag.
- *Yellow tags*: Indicate special operating equipment. These tags are meant to warn employees of any special conditions that exist before the equipment is operated.
- *Orange tags*: Are used when a trained employee enters a confined space that does not require a permitted entry. This tag indicates the location of the entry and the oxygen, carbon monoxide and flammable gas concentration measured in the confined space prior to entry. It is to be hung at the entrance to the confined space.

4.03 LOCKS

Although locks are not defined as a warning device, when a piece of equipment is under lockout this warns any individual, under any circumstance, not to operate the equipment. All locks used to secure

equipment from being energized accidentally must not be removed except by the person who installed them or by an authorized company representative. The following is list of the lock colors by position:

- Blue Lock – SCADA Technicians
- Green Locks – Mechanic/Welders
- Purple Locks – Operations
- Lavender Locks – Chemical Technicians
- Silver Locks – Hydro and Diesel Crews
- Black Locks – Distribution Maintenance Crews

4.04 BARRIER TAPE

Both red and yellow barrier tapes are used at TMWA. Each tape is used to designate the following:

- *Red barrier tape: **Do not cross.*** It is to be used when a clear threat of danger from possible injury exists and the barrier tape shall require all employees inside the perimeter to be wearing a hard hat, eye protection and work shoes.
- *Yellow barrier tape: **Caution*** should be taken when entering this area. All areas contained within the yellow barrier tape should be considered to present the potential for injury to anyone on the inside of the barrier. Personal protective equipment requirements should be listed on signs or tags hung on the barrier tape.

4.05 CONES AND CANDLES

All “designated vehicles” must be coned when parked in an area where traffic is present such as intersection, streets, and highways. Coning must be on the front and back of the vehicle. In accordance with the Vehicle Accident Prevention Administrative Instruction, the list of “designated vehicles” can be found on the TMWA Intranet.

When using cones for traffic control, cones of at least 18” with reflective tape must be used. Candles may be used in the place of cones.

Section 5 – Safety Information Availability

5.01 SAFETY INFORMATION AVAILABLE ON THE TMWA INTRANET

Each employee can use the intranet to access the following:

- Current information on safety meeting attendance
- Detailed safety procedures referenced in this handbook
- Forms such as:
 1. Checklists
 2. Logs
 3. Inspections
- Accident Reporting
- Accident Reporting Procedures
- Other current safety information

5.02 ACCESSING ELECTRONIC INFORMATION

Employees can view a variety of safety folders containing information on a multitude of safety topics on the Safety section of the Intranet.

5.03 SAFETY MEETING ATTENDANCE

Safety meetings are conducted each month to allow employees to discuss any safety concerns they have with others who share their risk. This also provides an opportunity to present and discuss new safety information.

Employees can view the safety meeting attendance record on the Safety section of the Intranet. Records for the current year are updated the month following the safety meetings.

Any questions regarding safety meeting attendance or safety meeting topics can be directed to the Safety Officer.

5.04 SAFETY PROCEDURES

This manual includes commonly used safety procedures that are used to protect employees from injury. The information provided in this handbook is an overview of these safety procedures and is meant to be a reminder rather than a detailed guide.

Further detail on a variety of topics, including the ones listed below, is available on the Safety section of the Intranet

- Lock Out/Tag Out
- Confined Space Entry, both permit and non-permit entries
- Hazard Communication Procedures:
 1. Handling and Storing
 2. Purchasing
 3. Labeling
 4. Disposal
- Chemical Hygiene Plan
- Traffic Control
- Accident Reporting
- Drug and Alcohol Testing

5.05 SAFETY FORMS AND CHECK LISTS

A variety of safety forms and check lists are available on the Intranet.

Forms are documents that are normally used to document an incident or request some type of change. Examples of the forms available include Accident and Injury Reports, Safety Meeting Attendance and the Safety Audit.

Check lists are documents that are normally used as a tracking device or as a reminder. Examples of available check lists include Confined Space Entry, Auto Accident Reporting and Trenching and Shoring.

5.06 ACCIDENT REPORTING (See Section 19)

For further information on Accident Reporting, employees should review Section 19 of this handbook.

5.07 OTHER SAFETY RELATED INFORMATION

In addition to pertinent work safety information, the Safety section of the TMWA Intranet contains information that may be useful for employees when off the job. Visit the website today!

Section 6 – Reporting Safety Problems

6.01 IDENTIFYING A PROBLEM

During the course of your work day you may notice a safety situation that needs to be reported (i.e. problem with equipment, location of equipment, equipment installation or condition, procedural, behaviors of another employee that are unsafe, etc.). It is essential that you report these concerns in order for the problem to be rectified.

Besides the obligation to report safety concerns, if you see something unsafe, take immediate steps to rectify the problem (i.e. if a simple clean up solves the problem then, clean up the spill). If you cannot fix the problem, make sure warnings are in place such as barrier tape or signs. Finally, if an employee's behavior is the problem, approach the employee and talk with them about the unsafe behavior and then report your concern to your Immediate Supervisor.

6.02 REPORTING THE PROBLEM

Each TMWA employee has various routes available to them for resolving a safety concern. First and most immediate is to discuss the problem with your Immediate Supervisor or onsite Foreman.

Another avenue for reporting safety concerns is to discuss your concerns with a member of the Safety Committee. There are five members of the Safety Committee, one from each occupational group in the bargaining unit, one from large member and one MPAT member. Their names are posted on the TWMA Intranet and are also posted on company bulletin boards.

Reporting to a member of the Safety Committee can be done anonymously or in person. You can choose to talk to an

individual Safety Committee member or attend a Safety Committee Meeting.

Another reporting option is to report your concern to the Safety Officer. The Safety Officer is responsible for investigating all safety concerns and making sure that they are addressed in the proper manner.

6.03 OSHA REPORTING

If you have reported your concerns using the above avenues and feel your concerns have not been properly addressed, you have the right to contact OSHA.

Section 7 – Personal Protective Equipment

7.01 EYE PROTECTION

Three types of eye and face protection are provided by TMWA for employee safety and include the following:

- Safety Glasses
- Goggles
- Splash Proof Goggles /Face Shields

Safety glasses are provided for employees in either prescription or non-prescription. TMWA will pay the cost of prescription up to a designated amount. All safety glasses shall be equipped with side shields. Removal of the side shields is prohibited. Safety glasses are required to be worn by all employees in the following situations:

- Drilling or chipping stone, brick, concrete, paint, pipe coatings, metals, or breaking frozen ground
- Flame welding, cutting, or burning (Approved colored lenses shall be used)
- Drilling with hand or electric drills
- When there is potentially injurious light or heat rays or any other danger of injury to eyes
- Venting, purging, or releasing pressure on mains, services, or meter sets
- Working on energized electrical equipment such as breakers or motor starters
- In confined spaces
- When there are flying particles caused by other workmen, if employee is within the range of such particles (A suitable screen around the work may be used instead)
- Any situation where the supervisor in charge considers the use of eye protection necessary
- Whenever an area is designated as an eye protection area

Splash Proof Goggles/Face Shields are used in situations when safety glasses are not adequate protection. Safety glasses (even with hardened

lenses) are not a substitute for goggles. Full-cover goggles and face shields which fit properly and are kept clean at all times shall be worn when an employee is engaged in or close to work involving the following:

- Power grinding, buffing, or wire brushing.
- Dust or flying particles (such as using compressed air to clean materials or machinery. When doing so, air must be reduced to 30 PSI, and there must be chip guarding or personal protective equipment)
- The use of other hot or injurious substances
- Handling acids, caustics, chlorines, ammonia, other similar liquids, or gasses
- Cleaning or scalding pipe
- Thermite (Caldweld) type welders
- Any situation where the supervisor in charge considers the use of goggles or face shield protection necessary
- Whenever an area is designated as requiring goggles and/or face shield

7.02 HEAD SHIELDS AND HOODS

Approved head shields or hoods shall be worn when:

- Electric arc welding
- Gas welding

7.03 RESPIRATORY PROTECTION

The first method of eliminating dusts, fumes, vapors, or gases shall be the use of equipment designed for the collection, diffusion and ventilation of such hazards unless this method is impractical.

7.03.01 Approved Respiratory Protection

Three types of respiratory protection are offered for certified TMWA employees and include:

- Self Contained Breathing Apparatus

- Air Purifying Respirator (disposable cartridges)
- Disposable HEPA Respirators.

Respiratory protection is only to be used by employees who are properly tested and trained.

7.03.02 Use of Respiratory Protection

- Self Contained Breathing Apparatus:
 1. When repairing small Chlorine Gas Leaks
 2. When assisting the TRIAD Team to repair a large Chlorine Gas Leak
- Air Purifying Respirator with disposable cartridges:
 1. When working with hazardous dust, fumes, vapors or gases when the concentration of these substances is below their IDLH. The concentration of the substance must be measurable before donning the respirator and entering the area
 2. Welding (or flame cutting) galvanized iron, materials containing cadmium, zinc, stainless steel, lead, Beryllium, mercury, or other substance which give off toxic fumes
 3. The oxygen concentration in the area is 20.9%
- Disposable HEPA Respirator:
 1. When working in an area where the dust concentration is irritating
 2. When the dust concentration is below the IDLH
 3. When the oxygen concentration is at 20.9%

7.04 FOOT PROTECTION

7.04.01 Allowable footwear

Employees shall wear boots/shoes that are appropriate for their work (i.e. boots for employees who work in the trenches; boots or shoes for customer servicemen, meter readers and water

plant employees). Footwear must have a leather or man-made sole that offers reasonable protection against penetration.

When using a jackhammer the employee must wear steel toe boots or suitable footwear with metal toe guards.

7.04.02 Prohibited footwear

Unless specifically recognized as safety shoe by ANSI Standards Z.41, the following types of footwear are unacceptable for field use (unless approved by the Safety Officer):

- Tennis shoes, jogging shoes, or other athletic footwear
- Canvas, open toe, or sandals
- Shoes with soft or sponge materials for soles/heels

The guidelines and requirements set forth in this safety rule apply to all employees assigned to, or visiting any operating facility and/or job site.

Employees assigned to office areas are not subject to these requirements.

7.05 HEAD PROTECTION

A hard hat furnished by TMWA shall be worn by employees in the following situations:

- When performing maintenance to energized equipment such as working on motor starters, breakers, or energized electrical supply lines
- When exposed to falling objects
- Whenever exposed to work being conducted overhead, no matter how little time is spent in the area. Even walking through such an area requires the use of hard hats
- When in areas confined by red barrier tape
- When working in an underground pump vault

- When working in a traffic control work-zone
- In confined spaces
- In any area designated as a hard hat area
- As required by the supervisor in charge

This rule applies to all supervisors or individuals observing the work, as well as the employee performing the work. Hard hats must not be defaced, painted, taped or have holes bored in them. All hard hat accessories shall be approved by TMWA.

7.06 HEARING PROTECTION

TMWA provides hearing protection to all employees. The following three types of hearing protection are TMWA approved:

- Disposable Earplugs
- Reusable Earplugs
- Earmuffs

Employees shall wear approved hearing protective devices as follows:

- When operating power tools
- When operation heavy equipment
- When operating jack hammer
- In all underground pump stations
- When in areas where signs have been posted indicating that hearing protection must be worn
- In all other areas where the noise level exposure will, or may, equal or exceed 85 dBA, eight (8) hour time (weighted average)
- When instructed by the person in charge

7.07 WORK APPAREL

Employees are expected to wear clothing suitable for the work they perform. In some cases TMWA provides clothing for employees. In most situations it is the employee's responsibility to wear appropriate work apparel. Work apparel should appropriately reflect

professionalism and workplace safety. The following is a list of the types of clothing required in particular locations or in certain situations:

- *Office Areas* – Attire that reflects professionalism based on customer interactions
- *Laboratory Area at Glendale and Chalk Bluff* – Leather shoes with rubber soles, no open toe, canvas or tennis shoe. Long pants and shirt or blouse, no tank tops, shorts or tee shirts
- *Glendale and Chalk Bluff (outside of office areas and lab)* – Good quality work boot with puncture resistant soles and sides. Long pants and work shirt
- *For areas near energized electrical equipment* – long sleeve fire-resistant shirts are required
- *All other company sites* – Good quality work boot with puncture resistant soles and sides. Long pants and work shirt
- *For areas near energized electrical equipment* – NFPA 70E compliant clothing must be worn

A fluorescent vest (orange or lime green) and hard hat shall be worn when an employee is within 15 feet of a public street or highway. This will include employees engaged in surveying, leak detecting, checking valves, locating underground facilities, and related work. Employees working on sidewalks are exempt from this requirement.

7.08 FALL PROTECTION AND LIFE JACKETS

7.08.01 Fall Protection

Various types of fall protection are provided by TMWA including handrails, netting and personal fall protection devices. These devices must be utilized whenever an employee is working within two (2) feet of an unguarded edge and six (6) feet or more above the adjacent surface.

Fall protection is also required when using a permanently installed ladder 20 feet or higher. Fall protection is required regardless of the duration of the job.

The types of fall protection provided by TMWA are as follows:

- Approved harnesses
- Approved lanyards
- Approved fall arrester devices
- Safety nets

Any questions or concerns should be brought to the attention of the Safety Officer.

7.08.02 Life Jackets

Life jackets are required whenever the work being done is in a location where there is the possibility of falling into dangerous water. The employee may choose to wear fall protection instead of a life jacket, as long as the fall protection will assure he cannot fall farther than six (6) feet and he cannot fall into the water.

Life jackets must be the type approved by the Coast Guard.

Examples of when life vests must be worn include but are not limited to the following:

- When on a boat
- Working within two (2) feet of the end on a flume
- Cleaning trash racks on the Water Treatment Plant
- Walking on floating covers at Hunter Creek or Highland Reservoirs

Section 8 – Excavation, Shoring and Trenching

8.01 GENERAL

Excavation, shoring and trenching shall be the responsibility of the competent person in charge. A competent person will be onsite at an excavation at all times work is being done in the trench.

The minimum safety guidelines for excavation, shoring and trenching shall be as follows:

- Any excavation in which the highest banks is five (5) feet or more above the floor of the trench shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving grounds or cave-ins.
- Trenches less than five (5) feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.
- Trenches 20 feet deep or deeper (measured from the highest side of the excavation to the floor of the trench). This requires a professional engineer to design the protection methods used in these types of trenches.
- Trenches are confined spaces and should be treated as such. All trenches shall be tested (using air monitoring equipment) and ventilated, if necessary, prior to entry. Any work which introduces a recognize OSHA hazard into the excavation requires that the excavation be treated as a 'permit required confined space'. For more information see the Confined Space Entry - Section 10 of this handbook.
- Any bridges, walkways, planks, etc. used to bridge any trench six (6) feet or deeper must conform to the requirements of fall protection.

8.02 SURFACE ENCUMBRANCES

All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees. Surface encumbrances may include the following:

- Equipment used near the trench such as a backhoe
- Any material to be used in the trench such as piping
- Barricades used to isolate the trench from traffic

8.03 UNDERGROUND INSTALLATIONS

Utility companies or owners shall be contacted within established or customary local response times and asked to establish the location of underground utilities. If the company cannot respond within 24 hours or cannot establish the location of the utilities the employer may proceed. Proceed with caution. When operators reach the approximate location of the utilities excavation, extreme caution should be exercised.

When the excavation is open the underground utilities shall be protected from damage during the work operations.

8.04 ACCESS AND EGRESS

- Ramps or stairs may be used to access the trench. They must comply with the requirements of OSHA 29 CFR 1926.651.
- Ladders may be used in the excavations. Ladders must extend three (3) feet above the rim of the trench and may be placed no more than 25 feet apart.

8.05 HAZARDOUS ATMOSPHERES

All trenches should be considered as confined spaces and treated as such. For more information, see the Confined Space Entry - Section 10 of this handbook.

8.06 WATER ACCUMULATION

Any excavation which is saturated with water, has standing water in the trench, or interrupts the natural draining in the excavation area shall not be entered by workers until it is inspected by a competent person.

8.07 ADJACENT STRUCTURES

Where the stability of the adjacent structures is threatened by the excavation an engineer must be consulted to determine the best method for stabilizing the excavations. An unstable excavation may be caused by the weight of the following:

- Buildings next to the trench walls
- Traffic
- Traffic barricades
- Heavy equipment used near the trench walls

8.08 BRIDGING A TRENCH

If a trench more than five (5) feet deep is to be bridged the bridging structure must meet all the requirements of the fall protection section of this handbook. All employees working within two (2) feet of an unguarded edge of a trench must be protected from falls within the requirement of the fall protection section of this handbook.

8.09 TYPES OF SOIL

During all excavations the soil type must be determined before any worker is allowed in the trench. It is the responsibility of the competent person on site to determine the soil type. The decision to slope or to use shoring and benching to protect employees from cave in is dependent on the soil type.

The soil types are as follows:

- *Stable Rock* - Does not exist for TMWA excavations
- *Type A Soil* - Must be previously undisturbed soil. Cannot exist for TMWA excavations since all of our trenches are used to uncover previously buried piping.
- *Type B Soil* - Cohesive soil with unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf (tons per square foot). Typical type B soils are sandy loam, silt, silty clay and granular cohesionless soils.
- *Type C Soil* - Cohesive soil with an unconfined compressive strength of 0.5 tsf or less. This type of soil is typically gravel sand and loam sand or soil from which water is freely seeping.

8.10 SOIL TESTING

Testing must be done by the trained competent person onsite to determine the type of soil in the excavation. If no testing is done then the soil must be assumed to be Type C. The testing required is as follows:

- *Plasticity* - Mold a moist or wet sample into a ball and attempt to roll it into thread as thin as 1/8 inch in diameter. Cohesive material can be successfully rolled without crumbling.
- *Dry Strength* - If the soil dries and crumbles on its own or with light pressure it is considered granular. If the soil falls into clumps and breaks up only with moderate pressure than it is considered clay. If the soil can only be broken with difficulty than it is considered unfissured soil.
- *Thumb Penetration* – Used to estimate the confined compressive strength of cohesive soil
- See ASTM Standard D2488 for elaboration on *Plasticity, Dry Strength, and Thumb Penetration*

8.11 BENCHING AND SLOPING

Benching or sloping can be used to protect workers in trenches less than twenty feet deep. The bench or slope selected depends on the type of soil present in the excavation. Since only Type B and Type C soils can be expected at a TMWA excavation, we will address benching and sloping for only these types of soils:

- *Type B Soil* - Can be benched on a 1:1 bench. This means that for every foot of rise in the trench there must be one foot of horizontal step. The maximum rise allowed is four feet before a step is built. The slope on Type B soil can be no less than 45 degrees and no more than 34 degrees.
- *Type C Soil* - benching is not permitted. However, sloping can be used on a 1:1 1/2 slope or a maximum of 34 degrees or slope.

8.12 SHORING

Shoring may be used in lieu of sloping in order to protect workers. All shoring must be in good serviceable condition. Shoring used in trenches more than 20 feet deep must be designed by a professional registered engineer.

Materials used for sheeting, sheet piling, bracing, shoring and underpinning shall be in good serviceable condition. Plywood used shall be 1.125 in. thick softwood or 0.75 in. thick, 14 ply, Artic White Birch (Finland form) sound and free from large or loose knots and shall be designed and installed so as to be effective to the bottom of the excavation.

Shoring systems may use wood or aluminum cross braces, uprights, or walls, or they may use hydraulic cylinders for the system construction. Pre-fabed systems such as steel boxes, aluminum boxes, slide rail systems, manhole boxes, water systems or beam and plate shoring may be used.

These systems must comply with OSHA CFR29 1926.650.

8.13 SLING SLOPING AND SHORING IN THE SAME TRENCH

When using shoring systems in conjunction with sloping the shoring walls must extend at least 18 inches above the bottom of the sloped trench walls.

Section 9 – Lockout/Tagout (LOTO) Operations

9.01 GENERAL

Whenever accidental starting of equipment during maintenance can injure an employee, then that equipment must be de-energized before work can begin. In addition a process must be used which prevents accidental reenergizing of equipment by someone working in the area. We refer to that process as Lockout/Tagout (LOTO).

Lockout/Tagout is required during the following operations:

- Maintenance on any electrical equipment connected to a power source
- Maintenance on any pumps connected to pressurized lines or to electrical motors
- Maintenance on any transfer lines (chemical or water)
- Maintenance on any storage tanks (water or chemical)
- Maintenance on any rotating equipment
- Maintenance on all water mains
- Working in the floc-sed basins
- Working in the filters
- Maintenance of the turbines or generators
- Maintenance of the flumes
- Maintenance of valves which control flow through a pressurized orifice

9.02 LOCKOUT/TAGOUT (LOTO) CLEARANCE

A clearance is a process that when followed to completion clears the equipment for maintenance to begin. A clearance process, when properly conducted, protects the workers involved in equipment maintenance. The clearance process at TMWA includes the following components:

- A clearance form which must be completed prior to start of work and released upon completion of the job or at the end of the day.
- A check-off sheet, which documents the process followed to de-energize the equipment to receive maintenance.
- A check-off sheet, which documents the process used to verify that the equipment is de-energized before work is started.
- A red tag on each activation device (switch, breaker, valve, relief, etc.) which if activated could result in an accidental energizing of the equipment
- A lock placed on each device requiring a red tag
- Notification of all employees, contractors, visitors, etc. in the area when work is to start and when it has finished

9.03 CLEARANCE FORM

A clearance form is available in the control rooms at Glendale, Chalk Bluff, and Hydro Plants or on the Safety section of the TMWA Intranet. Before the start of each LOTO, a clearance form must be completed for the equipment to be de-energized. The clearance form must contain the following information.

- Identity of the equipment and Clearance Number
- Reason for the LOTO
- Signature and printed name of the person requesting the LOTO
- Time LOTO is initiated
- Signature and printed name of the person requesting to be removed from the LOTO
- Time of removal request

9.04 LOTO CLEARANCE CHECKLIST

The LOTO check sheet must document the process used to de-energize the equipment. This sheet must contain the following information:

- Identity and description of the devices placed in a neutral position (off position or de-energized position)
- Location of red tags
- Location of locks
- Name and signature of the person who completed this form

9.05 LOTO VERIFICATION OF DE-ENERGIZED EQUIPMENT

It is not sufficient to follow and document a process in which the equipment is de-energized. The equipment must be tested to prove that the process has worked; only then can work begin. This can be accomplished in several ways:

- For electrical equipment you can operate the on/off switch to show it is dead or you can use a voltage meter to show the power supply to the equipment has been severed.
- For pressurized vessels you can use gauges to show no pressure exists in the vessel. You could also open a valve to verify that all pressure has been relieved.
- In some cases visual inspection is adequate. For example, it is only necessary to look in a flume to be able to determine that it is empty and no water flow exists.

In any of the above scenarios the method and results of the verification process must be documented in writing and the name of the person who verified a successful de-energizing process must be listed on the form.

9.06 TAGGING

Only red tags are used for a lockout/tagout process. The red tags can be obtained from the control rooms at either Chalk Bluff, Glendale or the Hydro-electric Power Plants. A tag must be placed on each piece of equipment, which can affect the maintenance process. Each red tag must contain the following information:

- Name of equipment tagged out
- Identity of the employee who placed the tag
- Clearance number (from clearance form in 7.03)
- Location in which the tag is hung
- Date and time the tag is hung

9.07 VACATING A CLEARANCE

The process used to vacate a clearance is the reverse of the one used to implement a clearance. Please see the Energy Control document on the Safety section of the TWMA Intranet for more information.

9.08 LOCKS

Locks are to be used on every device which is red tagged. Only the employee who hangs the locks is permitted to have a key for those locks. If more than one employee is working on the locked out equipment then each employee may hang their individual locks. Locks can only be excluded from this procedure if it is physically impossible to use them on the red tagged equipment by resorting to extraordinary means.

9.09 VACATING A CLEARANCE FOR AN ABSENT EMPLOYEE

In the event that an employee has forgotten to sign off on the clearance (remove locks, tags and sign clearance form) or is unable to do so, the following steps must be taken:

- All efforts must be taken to contact the employee and obtain their permission to remove them from the clearance
- If permission is given than a Foreman or Immediate Supervisor must remove locks, tags and signoff clearance sheet and note on the clearance form what has happened and what was done.
- If permission cannot be obtained (employee cannot be contacted in a reasonable time) then the locks, tags and clearance may be vacated by a Supervisor and an employee of equal competence to the missing employee
- Both the Supervisor and the competent employee must examine the area, agree it is safe to return the equipment to service and document the decision. The clearance can than be vacated and the equipment returned to service.

9.10 LOTO CHECK LIST

| Item | Yes | No |
|--|-----|----|
| Is the clearance form completed properly? | | |
| Is the clearance form signed and time coded? | | |
| Has the check sheet be completed? | | |
| Has the equipment been proven de-energized? | | |
| Have all tags been hung? | | |
| Locks accompanying all tags? If no why? | | |
| Has the work area been cleared of nonessential personnel? If no why? | | |

Section 10 – Confined Space Entry

10.01 GENERAL

A confined space is any space defined as the following:

- A space large enough and so configured that an employee can wholly enter (entire body) and perform work
- A space not designed for continuous human occupancy
- A space so designed that entry or exit is difficult

Any space meeting this definition is considered a confined space and must be treated accordingly. Examples of confined spaces at TMWA include but are not limited to the following:

- Flocculation sedimentation basins
- Water storage tanks or reservoirs
- Underground pump stations
- Water mains (large enough for an employee to enter)
- Trenches and excavations
- Flumes
- Pin stocks
- Filters

10.02 TYPES OF CONFINED SPACES

There are two types of confined spaces:

- *Permit Required Confined Space*
- *Non-permit Confined Space*

If the confined space contains a hazard that can cause injury to an employee who is working in the confined space it is a:

- *Permit Required Confined Space*

If the all hazards are eliminated from the confined space it is a:

- *Non-permit Confined Space*

Examples of hazards at TMWA include but are not limited to the following:

- Welding operations
- Using hazardous materials such as paint or cleaning solvents
- Unguarded moving equipment such as pumps
- Unguarded electrical equipment such as bare wires
- Unventilated areas
- Uncontained chemicals
- Pressurize air or water uncontained
- Drowning hazards
- Oxygen deficient atmospheres

10.03 AIR MONITORING EQUIPMENT

TMWA provides employees with equipment which can be used to measure the atmosphere in confined spaces prior to entry. TMWA provides *Air Monitors* which measure oxygen, carbon monoxide, flammable gases, hydrogen sulfite and chlorine gas. The *Air Monitors* are assigned to specific employees whose job requires them to frequently enter confined space. For spare *Air Monitors* and more information see the Safety Officer.

Before using an *Air Monitor*, it must be auto-zeroed and the calibration checked against a known standard. For monitors not used on a regular basis, the calibration must be checked at minimum monthly.

10.04 NON-PERMIT CONFINED SPACE ENTRY

Any confined space proven to be hazard-free can be entered by a trained employee using the following methods:

- Sample air in confined space and determine it is 20.9% oxygen, 0 ppm carbon monoxide and 0% flammable gases
- Record and hang readings at the entrance to the confined space

- Continuously sample air in the confined space

10.05 PERMIT REQUIRED CONFINED SPACE ENTRY

The procedure for entry into such a space is located at each of the plants, Capital Blvd. Office, and the Safety section of the Intranet.

The following must be present in any permit required entry:

- Permit completed and hung at entry to the confined space
- Entry supervisor
- Entry attendant, properly trained
- Record of pre-entry safety meeting
- Continuous monitoring of conditions in the confined space
- Continuous monitoring of the condition of the employee working in the confined space
- Method for remotely rescuing the employees from the confined space, if required
- Written procedures for a rescue requiring entry into the confined space

10.06 ENTRY RECORDKEEPING

All records associated with a permit entry must be kept in accordance with TMWA's Record Retention Schedules and should be returned to the Safety Officer following the safe completion of the project. The following records must be kept:

- Permit
- Log of pre-entry safety meeting
- Log of condition inside of confined space
- Log of communication between attendant and entry team
- Written rescue procedures
- Entry Log

10.07 CONFINED SPACE CHECK LIST

| Item | Yes | No |
|---|-----|----|
| Is the confined space permit required? | | |
| Is there a hazard present inside of the confined space? | | |
| Is the permit on site and properly completed? | | |
| Has the atmosphere been checked prior to entry? | | |
| Is a supervisor present? | | |
| Is an attendant at the confined space entry? | | |
| Is the attendant properly trained? | | |
| Is there a log of the pre-entry safety meeting? | | |
| Is there a provision for remote entry rescue? | | |
| Is the attendant in constant contact with the entry team? | | |
| Is there a written plan for entry required rescue? | | |
| Has the paperwork been given to the Safety Officer? | | |

Section 11 – Office Safety and Ergonomics

11.01 GENERAL

Safety is also important in the office setting. General safety rules that should be followed in office areas include the following:

- Chairs, wastebaskets, cords and other articles should be removed from aisles.
- Desk drawers, cabinet doors, slides and files should be closed while unattended.
- Common or sharp-pointed pins shall not be used for fastening paper together. Use approved staples, paper clips, etc.
- Broken glass or other sharp-edged objects should not be placed in wastebaskets, unless properly protected.
- Approved ladders or other safe supports should be used to reach material on high shelves or above shoulder height. Standing on chairs, desks, and cabinets is strictly prohibited.
- Extension cords are to be used only for temporary arrangements. They are to be used for a maximum of thirty (30) days. The only exception are GFI's use for protection of computers, printers, monitors, etc.

11.02 ERGONOMICS

Ergonomic and repetitive motion concerns should be brought to the attention of your Immediate Supervisor or the Safety Officer.

Ergonomic and repetitive motion concerns are addressed on an individual basis. However, the following general rules apply to and should be followed by all employees:

- Maintain straight lines of body postures (i.e. keep you back straight when sitting)
- Never lift and twist at the same time
- Lift with your legs not with your arms

- Keep weights as close to your body as possible
- Make more trips with lighter loads than trying to finish the job as soon as possible
- Pay attention to minor pains or irritation

11.03 OFFICE SAFETY CHECK LIST

| Item | Yes | No |
|--|-----|----|
| Are all walkways at least three (3) feet across? | | |
| Are boxes, wires, files, etc. being stored in a walkway? | | |
| Are extension cords being used? If so for how long? | | |
| Are all draws closed when not in use? | | |
| Are fire extinguishers available? | | |
| Are ladders or step stools provided? | | |
| Are items stored on top of file cabinets, top shelves, etc., without being secured? | | |
| Is the lighting sufficient? | | |
| Are evacuation routes posted? | | |
| Is the area clean and free from debris? | | |
| Is there sufficient room (at least three (3) feet) around office machines such as copiers and fax machines to allow free movement? | | |
| Are all electric outlets and light switch covers in place? Are any broken or cracked? | | |
| Are all exits to the outside identified? | | |
| Are all chairs in good condition (i.e. bent legs)? | | |

Section 12 – Portable Ladders and Scaffolds

12.01 GENERAL GUIDELINES

- An employee shall not use a ladder that has broken, loose, or cracked rungs, side rails, or braces.
- When ascending or descending ladders, the employee shall have both hands free to grip the sides or rungs and face the ladder.
- Boxes, crates, chairs, etc., are not be used to stand on while working.
- Only one employee shall work from a ladder (except hook ladders). If the work requires two employees, a second ladder shall be used.
- If a ladder is to be placed where the opening of a door may displace it, the door shall be locked or otherwise guarded.
- Ladders shall be inspected frequently and repaired or replaced when found to be defective.
- Wooden ladders with metal side rails, wire supports, or metal ladders shall not be used near energized equipment or lines.
- Ladders shall not be painted. They shall be treated only with a transparent non-conducting material.
- Only ladders approved by the company shall be used by employees.

12.02 STRAIGHT OR EXTENSION LADDER USE

- Straight ladders shall not be used unless equipped with approved safety shoes. The distance from the foot of the ladder to the support it rests against should equal one-fourth the length of the ladder.
- An employee shall not work or stand on either of the top two rungs of a ladder.
- Short ladders shall not be spliced together.
- A ladder shall never be placed against an unsafe support.
- Ladder feet shall be placed on a substantial base.
- Ladders shall not be used as scaffold platforms.

- Ladders used in positions requiring support shall be secured by means of an additional workman or by rope slings.
- A ladder used to gain access to a roof shall have the top of the ladder extend at least three (3) feet above the point of support at eave, gutter, or roof line.

12.03 STEP LADDER USE

- Employees shall not work from the top step of a ladder. (This rule does not apply to safety platform ladders.)
- While an employee is working on a step ladder (except a safety platform ladder) at a point of 10 feet or more above ground or floor, the ladder shall be held by at least one other person.
- Step ladder legs shall be fully spread when ladder is in use.
- Step ladders shall not be used as straight ladders.
- Step ladders longer than 20 feet shall not be supplied.

12.04 SCAFFOLD USE

- Scaffolds shall not be erected, moved, dismantled or altered except under the supervision of competent persons per OSHA 1926.451.
- All scaffolds shall be of sufficient strength and rigidity to safely support at least four (4) times the weight of workers and material to which they may be subjected.
- Guard rails and toe-boards shall be installed on all open sides and ends of scaffold platforms more than 10 feet above the ground or floor. Where persons are required to work or pass under the scaffold, scaffold shall be provided with a screen between the toe-board and guard rail extending along the entire opening. Screen shall be of No. 18 gauge U.S. standard wire, ½ inch mesh, or the equivalent.
- Scaffolds four (4) to 10 feet in height, having a minimum horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- Scaffolds shall not be moved without removing all loose tools, materials, and equipment resting on the scaffold deck.

12.05 LADDER AND SCAFFLOD CHECK LIST

| Item | Yes | No |
|---|-----|----|
| Are all rungs in good condition (no broken rungs)? | | |
| Are side rails and braces in good condition (no breaks or cracks)? | | |
| Are the top two rungs of the ladder marked “Do not use”? | | |
| Is the ladder tied off? (extension ladder) | | |
| Is the distance between the wall and the bottom of the ladder $\frac{1}{4}$ of the height of the ladder? (extension ladder) | | |
| Are ladder Shoes in use and in good shape? | | |
| Is the ladder extended at least three feet beyond the top surface?(extension ladder) | | |
| Are the legs of the ladder completely extended? (step ladder) | | |
| Is the ladder more than 10 feet high (step ladder)? If so is someone holding the ladder in place? | | |
| Is the proper ladder in use, extension for flat surface, step for areas of no surface support? | | |
| Is a competent person present at the site of the scaffold? | | |
| Is there paperwork that a competent person supervised the erection of the scaffold? | | |
| Are guardrails and toeboards in use on the scaffolding? | | |
| Is fall protection being provided? | | |

Section 13 – Hand and Power Tools

13.01 GENERAL GUIDELINES

- All files, rasps, and other hand tools which have a sharp tang shall not be used without approved handles.
- Tools, except those normally carried on belts, which must be raised or lowered from one elevation to another shall be placed in approved tool buckets or firmly attached to hand lines.
- Tools shall not be thrown or tossed under any circumstances.
- Tools shall not be left lying around where they may cause tripping or stumbling.
- Tools shall never be placed unsecured on elevated places.
- When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating in order to prevent tools or parts from dropping to a lower level or the danger area shall be barricaded or guarded by an employee.
- Portable electric tools (except those with self-contained power or double insulated) such as electrical drills and saws shall have their frames effectively grounded at all times while connected to a source of power.
- The insulation on hand tools shall not be depended upon to protect users from shock.
- Grinding machines should be inspected before use. Such inspections should be done to the following:
 - Hood
 - Glass shield
 - Work rest
 - Wheel face

13.02 USE OF TOOLS

- Hammers with metal handles or screwdrivers with the metal continuing through to end or sides of handles shall not be used on or near energized electrical equipment.

- Metal measuring tapes, tapes having metal strands woven into the fabric, brass bound rules, metal scales and gauges, wire or metal bound hose, or rope with wire core shall not be used when working on or near energized electrical circuits or equipment.
- Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs (not with the hands) while being struck with a sledge by another employee.
- Tools shall be used only for the purpose for which they are designed.
- Before making adjustments or changing air tools, unless equipped with quick-change connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking connection.
- Practical jokes with compressed air are strictly forbidden. Compressed air entering or blown against the body may result in serious injury or death.
- Compressed air shall not be used to clean clothing while being worn. Nor shall it be used to blow dust or dirt out of hair.

13.03 CARE OF TOOLS

- All tools, regardless of ownership, shall be of an approved type, maintained in first class condition and be subject to inspection at any time. A Supervisor has the responsibility and authority to condemn tools.
- Tools with sharp edges shall be so stored and handled so as to not cause injury or damage. They shall not be carried in clothing pockets.
- All cutting tools such as saws, wood chisels, drawknives and axes shall be kept in suitable guards unless special compartments are provided for their storage.

13.04 GUARDS

- No guard shall be removed from a machine while it is in operation.
- Machines and power tools shall not be operated with guards removed except where temporary protection is provided. If it is necessary to place temporary guards on any apparatus, they shall be of substantial construction, suitable for the purpose intended and shall be replaced by permanent guards as soon as possible.

13.05 MACHINE AND POWER TOOL SAFETY CHECK LIST

| Item | Yes | No |
|---|-----|----|
| Are the cords in good condition, no frayed or broken sections? | | |
| Are all hand tools equipped with handles in good working condition? | | |
| Are all machine guards in place? | | |
| Are all tools stored properly when not in use? | | |
| Are any of the power tool casings cracked or broken? | | |
| Are tools clean? | | |
| Is PPE available for use when operating the power tools? | | |

Section 14 – Traffic Work Zones

14.01 GENERAL GUIDELINES

Traffic control is used to protect pedestrians, drivers and those workers whose job requires them to work near traffic areas. Traffic control is used in the following situations:

- When work is being done within 15 feet of the road.
- When the work will interfere with the normal flow of traffic
- When the work will endanger pedestrians, generally by forcing them into traffic lanes

At TMWA, we have many situations in which our employees must implement traffic control measures. The following is a list of many but not necessarily all situations in which some type of traffic control should be implemented:

- When repairing water mains which require road closures or interfere with the normal flow of traffic on affected road
- When operating valves which are located in normal traffic flow areas
- When working in underground pump vaults which are located in normal traffic areas
- When closing a road to perform maintenance on TMWA facilities
- When working inside of underground pump vaults in pedestrian walk ways

14.02 APPLICATION OF TRAFFIC CONTROL

14.02.01 Work Performed on the Roadside (Outside of the Shoulder)

When work is being performed off the roadway yet within the right-of-way little or no temporary traffic control is needed. If

there is little or no affect upon traffic than no control devices are needed. Please note that this is rarely the case.

Even for work preformed well away from the shoulder there may be driver distractions. Vehicles parked on the shoulder may be accessing the work site or equipment may on occasion need to travel on or cross the roadway. For these situations use of a single warning sign, such as “Road Work Ahead” or “Utility Work Ahead,” will suffice.

14.02.02 Work Preformed on the Shoulder

When a highway shoulder is occupied, warning is needed to advise the driver and protect the workers. As a minimum, the single warning sign “Shoulder Work” is adequate. When work is performed on a paved shoulder eight (8) or more feet wide, a transition area is needed where channelizing devices are placed on the taper of the length that conforms to the requirements of the shoulder taper.

14.02.03 Mobile and Short Duration Work

We do not anticipate doing any mobile work at TMWA; however, we may be doing a considerable amount of short duration work. This type of work would include changing charts in underground pump stations, or opening or closing valves located in the street. Short duration work is usually defined as work that takes less than 60 minutes to complete. Since the amount of time it takes to properly set up a work zones is about 60 minutes and considering that setting up a work zones puts employees at risk, short duration work requires simplified control procedures, which includes arrow boards on the back of the vehicle and warning signs.

14.03 WORK ZONES AT COMPANY LOCATIONS

Many TMWA facilities, such as regulators or pump vaults, are located in areas which require that a work zone be set up prior to entry. For those locations we have developed a book of work zone plans. These books are located at Glendale and in the Safety Office.

Please refer to this book for specifics on setting up the work zones. For a work zone not listed in this book, see your Immediate Supervisor for assistance.

Section 15 – Electrical Safety

15.01 GENERAL

Electrical equipment shall always be considered as energized until it is positively proven to be de-energized and properly grounded.

IF IT ISN'T GROUNDED IT ISN'T DEAD!

There is no job so important - nor any service so urgent - that we cannot take the time to work safely.

15.02 QUALIFIED PERSONS

- A qualified employee shall be defined as an employee who is qualified by training and experience in the job which is to be performed.
- There shall be two qualified employees in the immediate work area while “hot work” is in progress.
- There shall be a qualified employee outside the vault while HOT WORK is in progress. This employee shall provide continuous supervision or instruction and act as an observer for the purpose of rendering assistance in the event of an accident.
- If in the judgment of the supervisor and qualified employee(s) performing the work, a task cannot be SAFELY completed while energized; the equipment shall be de-energized before working on the equipment.

15.03 CLOTHING

- Shirts or jackets with full-length sleeves shall be worn when:
 1. Handling, working on, or climbing structures near energized lines or equipment
 2. Exposed to hot or injurious substances or open flame

- Gloves are required when:
 1. Handling, working on, or climbing structures near energized lines or equipment
- Safety glasses are required when:
 1. The possibility of exposure to an electrical arc or flash exists
- Metal watch bands, metal chains, key chains, or metal tie chains or clasps shall not be worn, or will be wrapped with non conductive material, when working on or near live electrical equipment.
- Shirts or jackets with full length sleeves rolled down, gloves, safety glasses, and face shields shall be worn when under such other conditions as the supervisor in charge shall direct.

NOTE: It is the individual's responsibility to comply with the rule (per OSHA regulation 1910 Subpart I).

15.04 PLANNING HAZARDOUS WORK

Unusually hazardous jobs shall not be started without first consulting your Immediate Supervisor or their authorized designee.

15.05 CLEARANCES

Before any employee starts work on de-energized equipment or apparatuses for which clearances are required, he/she shall either obtain a clearance, or work under a qualified employee who holds a clearance.

15.06 GENERAL PRECAUTIONS

- All noncurrent-carrying metal parts of energized electrical equipment that are not properly grounded shall be considered as being energized at the highest voltage to which they may be subjected.

- An employee shall avoid working on circuits or apparatuses from such a position that a shock or slip would tend to bring his/her body toward exposed energized parts. In all possible cases, work should be done from below rather than above energized circuits or apparatus.
- When working on or about live parts and insulated from ground, employees shall not exchange tools or other objects with persons who are not so insulated.

15.07 TESTING EQUIPMENT

Electrical equipment shall always be considered as energized unless they are positively known to be de-energized. Before starting work, preliminary inspections or tests shall be made to determine what conditions exist. Equipment may sometimes become energized by reason of faulty or inadequate connections. Care shall be exercised when handling all ground wires.

15.08 CARE OF RUBBER PROTECTIVE EQUIPMENT

- Rubber gloves shall be carefully inspected for corona cracks and bruises and shall be given the roll and air test before using, preferably at the beginning of the work day and at any other time when their condition is in doubt.
- Rubber gloves shall never be worn inside out. They shall be exchanged at any time they become damaged or the employee to whom they are assigned becomes suspicious of them.
- Protective leather gloves shall be used only as a protective covering for rubber gloves. Their use for any other purpose creates a safety hazard and will not be permitted.
- Gloves, when not in use, shall be kept in canvas bags or other approved containers and stored where they will not become damaged from sharp objects or exposed to direct sunlight. They shall never be folded while stored nor shall other objects be placed with them.

- Hose, hoods, blankets, guards, and other protective equipment shall be visually inspected before each use.
- Rubber blankets shall be protected from physical damage and moisture by means of a tarpaulin, canvas, or protective mat.
- Extreme care shall be exercised to avoid puncturing rubber protective equipment.
- To avoid corona and ozone damage, rubber protective equipment shall not be allowed to remain in place on energized lines or apparatuses overnight or for more than one eight-hour period unless approved by the supervisor in charge.
- Rubber protective devices shall be stored in the container provided and placed in special compartments on trucks or elsewhere where they will not be subjected to damage from chemicals, tools, or other equipment.
- Rubber goods shall be submitted for testing on a regular scheduled basis in accordance with established company procedures.

Section 16 – Welding Safety

16.01 COMPRESSED GASES AND WELDING

16.01.01 Storage

- Cylinders shall not be allowed to come in contact with energized conductors or ground wires from electrical equipment.
- A full cylinder shall be connected to a header or manifold with other cylinders only when their temperatures are approximately the same.
- Only those fuel gas cylinders that are in actual use, secured in place, and connected to manifold, welding set, shall be permitted in the main building of a generating station. All empty and spare cylinders shall be stored elsewhere with their valves tightly closed and caps in place and secured according to OSHA regulations. Cylinders stored outdoors shall have their valves and safety devices protected from snow and ice.
- The valves of compressed gas cylinders shall be opened slowly and only with the special wrench or hand wheel provided.
- Employees shall never tamper with the safety relief devices in valves of cylinders.
- Employees shall never force connections that do not fit.
- Oil or grease shall not be allowed to come in contact with valves, regulators, gauge connections, or any other parts of oxygen cylinders or apparatuses.
- Compressed gases shall not be used from a cylinder or cylinder manifold or other container unless an acceptable pressure regulating device is installed on the cylinder, valve, or manifold.
- Before removing the regulator from a cylinder, close the cylinder valve and release all pressure from the regulator.

- All connections to piping, regulators, and other appliances shall be kept tight to prevent leakage. A leaking cylinder shall not be used.
- Never use a flame to detect flammable gas leaks.
- The recessed top of cylinders shall not be used as a place for tools.
- No attempt shall be made to mix gases in a cylinder or to transfer gas from one cylinder to another.
- “No Smoking” signs shall be posted at entrances to areas where hydrogen is used or stored.
- Never apply heat directly to any compressed gas cylinder to raise the cylinder temperature or to increase gas withdrawal rates.

16.01.02 Handling Cylinders

- Extreme care shall be exercised in handling all high-pressure cylinders. They shall not be dropped or jarred. Bumping mats, hydraulic tailgates, or other approved methods shall be used in lowering cylinders from trucks.
- To prevent cylinders overturning, cylinders containing compressed gases must be securely lashed in an upright position, loaded into racks securely attached to the motor vehicle, packed in boxes or crates of such dimensions as to prevent their overturning, or loaded in a horizontal position. Specification DOT-4L cylinders must be loaded in an upright position and securely braced.
- Cylinders shall not be rolled on their side and shall not be carried by their valves or caps. They may be moved by tilting and rolling on their bottom edge.
- A suitable truck, chain, or other holding device shall be used to keep cylinders from being upset while in use.
- Portable gas cylinders or containers whether full or empty shall be stored in a suitable, well ventilated location and properly secured in an upright position with caps in place.

(Except one-ton chlorine cylinders, which are stored horizontally).

- Portable gas cylinders or containers shall not be exposed to excessive heat and shall not be placed or stored where sparks from welding or cutting operations can reach them.
- Oxygen cylinders shall not be stored near gas cylinders containing flammable gases (hydrogen, butane, propane, acetylene, etc.) or with oils, greases, or flammable liquids.
- When necessary to store indoors, oxygen and any of the above flammable products shall be placed in separate areas or separated by a fire-resistant wall.
- Cylinders containing chlorine, propane, or hydrogen shall not be stored in a general storeroom. They shall be stored in separate, well ventilated, fire-proof areas.
- Portable propane containers must not be stored near exits, stairways, or in areas normally used or intended to be used for the safe egress of people.

16.02 WELDING AND CUTTING

16.02.01 General

- Compressed gases shall be used only by experienced and properly instructed persons.
- It shall be the responsibility of the welder to see that, where practical, screens are properly placed to prevent eye injury to fellow workmen and onlookers. Helpers shall wear suitable eye protection when assisting in welding.
- When welding or cutting in elevated positions, precautions shall be taken to prevent sparks or hot metal from falling onto people or flammable material below.
- Suitable fire extinguishing equipment shall be immediately available at all locations where welding and cutting equipment is used.
- Matches shall not be carried by Welders or Helpers when they are engaged in welding or cutting operations.

- In dusty or gaseous spaces where there is danger of causing an explosion, welding or cutting equipment shall not be used until the space is adequately ventilated. Certain conditions will also require the wetting down of the area.
- Open flames shall not be brought near to, nor welding processes, brazing, flame cutting, or soldering done on any empty container, tank, or other vessel which has previously contained a flammable or explosive substance, except pipe lines which are covered in Rule 1.07.04/1, until one or more of the following precautions, as required for each job, have been taken to prevent explosion or fire:
 1. Clean with water, steam, or caustic solution.
 2. De-scale using non-sparking tools.
 3. Remove residue or other flammable material from area of work to be done.
 4. Fill container or vessel with water or inert gas such as carbon dioxide or nitrogen.
 5. Provide ample venting to remove explosive mixtures.
 6. Provide an observer or nitrogen.
- Welding processes may not be performed on the outside surface of a container, tank, or other vessel containing liquid flammable material, except pipe lines which are covered in Rule 1.07.04/1, provided the work is done not less than six (6) inches below the level of the liquid and there is little likelihood of burning through the vessel wall.
- Welding processes may be performed on the top surface of a vessel, which is partially filled with a liquid flammable material which cannot be removed, only after the area above the liquid is filled with steam, carbon dioxide, or other inert gas and the vessel is held under positive pressure. This will not apply to LPG vessels.
- Welding processes, flame cutting, brazing, metalizing, soldering, and the use of open flames on vessels subject to possible ignition of contents shall be done in accordance

with approved procedures by fully qualified personnel who shall observe the following additional precautions:

1. Keep away from vessel openings as far as possible
 2. Hazardous areas shall be designated by signs and protected by approved barricades as required
 3. Empty vessel shall have vent open and a continuous flow of inert gas shall be maintained through it during the process
- Whenever lead, cadmium, galvanized, or other toxic fume producing material is welded, burned, or otherwise heated to such a degree that fumes from the metal or its fluxes are generated, the work shall be ventilated so that the workmen performing the operation are not exposed to hazardous concentrations of fumes or the workmen shall be protected by approved respiratory equipment.
 - If respiratory equipment is required to protect workmen performing the operation, the following additional precautions shall be observed:
 1. Sufficient ventilation shall be provided for the protection of others to prevent accumulation of harmful quantities of fumes in the work area
 2. The operation shall be isolated
 3. The work shall be performed outdoors in such a location that fumes will not enter any building in harmful quantities
 - When performing any repairs or alterations on chemical or fuel piping, a qualified person shall be accountable for the work to see that all proper precautions to prevent explosion or fire are observed and all safety rules and procedures applicable to the use of special apparatuses to affect such repairs or alterations are followed.
 - The use of open flames in battery rooms is prohibited except under the direct supervision of a qualified and experienced person and then only after the room has been well ventilated.

- When burning into a pipe or closed vessel, stand on the opposite side in the clear. Where there is danger of causing a fire in the area during a welding operation, a second employee shall stand fire watch.

16.02.02 Electric Welding

- No electrical welding machine, either AC or DC, shall be operated until the machine is properly grounded.
- To protect eyes, face, and body during electrical welding and cutting, the operator shall wear an approved helmet, proper protective gloves, and clothing. Other employees shall not observe electric welding operations unless they use approved eye protection.
- Proper eye protection shall be worn to guard against flying particles when the helmet is raised.
- Workers or other persons adjacent to the welding areas shall be protected from the rays by noncombustible or flameproof screens or shields or shall be given ample warning before striking an arc with an electrode.
- See OSHA regulations CFR 1910.133 and CFR 1910.252 for additional clarification

16.02.03 Gas Welding

- Suitable eye protection, gloves and clothing shall be worn during the welding or cutting operations or while cleaning scale from welds.
- Matches shall not be used to light a torch; a torch shall not relight on hot work. A friction lighter or stationary pilot light shall be used.
- Hose shall not be repaired with tape.
- When welding equipment is not in use, the cylinder valves shall be closed.
- Oxygen jet is not to be used to blow debris away from an area where welding or cutting is to be performed.

- Cylinders not having fixed hand wheels shall have key handles or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installation only one key or handle is required for each manifold.

Section 17 – Rigging

17.01 GENERAL

The material presented in this section is to be used only as a reminder for safety considerations when working with cranes and rigging. Only competently trained employees should be involved with lifting heavy materials using cranes, hoists, or lifts. When a competent employee is not familiar with the proper lifting techniques, they should consult a competent engineer.

17.02 WIRE ROPE

17.02.01 Inspection

Before using wire rope it should be inspected for the following flaws. If the rope does not fit the following criteria discard and use a new one:

- *Broken Wires* - In general finding one broken wire (or several widely spread) is usually not uncommon and does not present a problem. Depending on how the rope is to be used the number of acceptable broken wires may vary. Generally between 6-12 broken wires in one rope lay or 3-4 broken wires in one strand present a problem which must be corrected.
- *Abrasion* - Wire rope windings over drums or through sheaves will wear. The usual requirement is replacement if the outer wire wear exceeds 1/3 of the original diameter. This is not an easy measurement and should be conducted only by a competent person.
- *Crushed Strands* - This condition is a result of too many layers of rope wrapped around a drum. The general recommendation is to have no more than two layers on the drum, especially if the rope is a type with many small wires such as 6 x 19; however, the drum diameter should be increased as the rope is less flexible. Crushing is also

caused by cross winding, which is a result of poor winding procedures when the rope is wound in a pile in the middle of the drum.

- *Corrosion* - This problem is difficult to evaluate, and it is also much more serious than normal wear. Corrosion will often start inside the rope before it shows on the outside. A lack of lubrication is usually the cause. Wire pitting or severe rusting should be an indication that the rope needs replaced
- *Kinks* - Kinks are permanent distortions. After a wire rope is kinked it is impossible to straighten the rope enough to return it to its original strength. The strands will not have an equal load distribution at the straightened kink.
- *Electric Arc* - Wire rope that has been accidentally used as a ground in welding, or has been in contact with a live power line will have fused or annealed wires and must be removed from service.
- *Metal Fatigue* - This wire rope problem is usually caused by bending stress from repeated passes over sheaves, or from vibration, such as crane pendants. Fatigue fractures can be either external or internal. A larger sheave or drum size, or using a more flexible rope may increase the rope life.
- *Diameter Reduction* - Any noticeable reduction in diameter is a serious deterioration problem. Diameter reduction should be checked only by a competent person.
- *Wire Rope Stretch* - Any new wire rope will stretch when the initial load is applied. A new rope is slightly oversized and this initial constructional stretch will bring it down to its approximate correct nominal size. After the initial stretch and a slight stretching over time the rope will begin to stretch at a quicker rate, which means it is approaching the time for replacement.
- *Bird Caging* - This torsional imbalance is a result of mistreatment such as pulling through tight sheaves, wound on too small a drum, or sudden stops.

- *Scrubbing* - This is a wearing or displacement of wires resulting from rubbing against something.
- *Protruding Core* - Any rope damage resulting in a spreading of the strands with the core bulging out means the rope should be replaced.

17.02.02 Lubrication

A wire rope is lubricated during the manufacturing process. This provides the rope with protection for a reasonable time if the rope is stored under proper conditions. When the wire rope is in service the initial lubrication will not be sufficient to last the lifetime of the rope. Because of this it is usually necessary to apply lubrication to a wire rope under working conditions. A light mineral oil can be used for lubrication. Never use old crankcase oil.

17.02.03 General Precautions

- Make sure the wire rope suits the application and inspect the rope regularly.
- Always apply a safety factor to any wire rope in use.
- Do not overload the rope and minimize shock loading, especially in cold weather.
- Exercise caution and increase the safety factor when there is a danger to personnel, the conditions are abnormal, or the exact load weight is not known.
- Use softeners on the corners of steel edges, and do not drag a rope from under a load.
- Do not let slack loops be pulled tight into a kink. A kink creates permanent damage.
- Never use damaged wire rope.
- The rope must spool properly on the drum. The drums and sheaves must be of sufficient diameter. Do not put excessive wire rope layers on any drum.

- Sheaves with worn or scored grooves, broken rims, or faulty gearings should be replaced. Use the correct fleet angle. Match the sheave with the rope size. Try to avoid reverse bends.
- Premature wear at one localized spot is a common occurrence. This problem can be reduced by regularly moving the rope away from the wear point. On a drum the crossover points can be changed by cutting a short section of the rope off and then reconnecting it. A short localized wear area from a sheave can sometimes be changed by cutting off a section of the rope. Another option is to reverse the rope. A rope with broken wires by a fitting can be repaired by cutting off a short section and reconnecting the rope to the fitting.

17.02.04 Safety Working Loads

Most hoisting jobs use a Safe Working Load based on a 5:1 safety factor of the wire rope breaking strength. This safety factor should go higher if there is a possibility of injury or death due to rope failure. For example, elevators are based on a 20:1 safety factor. Critical lifts with a danger to personnel should be calculated on a 10:1 safety factor. If using a breaking strength chart calculate the safe working load as follows:

$$\underline{\text{Safe Working Load} = \text{Breaking Strength} / \text{Safety Factor}}$$

- A general rule of thumb formula can be used to find the safe working load of a wire rope as follows:

$$\underline{D^2 \times 8 = \text{Safe Working Load in tons}}$$

Where D^2 = diameter of the wire squared

17.03 SLINGS AND CHOKERS

17.03.01 Safety Working Loads

Slings and chokers are continually subjected to abnormal abuse due to overloading, abrasion, crushing, kinking, and impact loading. Extra stress is often put on chokers when the sling angle is increased to unacceptable levels.

There is no consistent safety factor used for slings by wire rope manufacturers and the authors of safety books. The safety factors of charts and formulas vary from a low of 5:1 to a high of 8:1. The rule of thumb formula to find the safe working load for a sling or choker is:

$$\underline{D^2 \times 6 \text{ (in inches)} = \text{Safe Working Load (in tons)}}$$

D^2 = diameter squared. The above calculation gives a safety factor of approximately 6:1.

17.03.02 Synthetic Web Slings

Synthetic slings offer good protection from machined parts, are non-sparking, light weight, and very elastic. The elastic feature reduces shock loading. A flexible flat sling has the ability to hug the load closer and this prevents any of the material from slipping out during handling.

These slings are commonly made of nylon, however, several other materials are used as well. Check with a reputable safety systems distributor for the proper sling material used with specific hazardous products.

Synthetic slings must be inspected before each use. Slings must be removed from service if any of the following conditions are present:

- Acid or caustic burns
- Melting or charring of any surface part
- Broken stitches
- Distorted fittings
- Red core warning yarn showing

A rule of thumb for single ply slings is a safe working load of 1600 pounds per inch of width.

17.03.03 Sling Angle Safe Working Load

The stress imposed on a bridle sling configuration depends upon the angle to the horizontal formed by the legs lifting the load. Two vertical slings lifting a 1000 pound weight will each have a load of 500 pounds.

When the sling legs are pulled together into a common hook, each sling leg will have load increase. This sling leg load increase is often not realized by the person hooking up the load. At an angle of 60° the leg load is 115% of the vertical load. At an angle of 45° the sling leg load is increased to 140% of the vertical load.

The recommended safe lifting angle for sling legs is 60°. The minimum lifting angle is 45° or higher. Lifting at 60° creates an equilateral triangle, where all three sides are the same length.

17.04 CHAIN

17.04.01 General

Try to avoid using chain when it is possible to use wire rope. The failure of a single link of a chain results in the complete failure of the chain, whereas the wire rope is made up of many wires and strands and they must all fail before the rope breaks. A chain usually gives no warning when it is about to break. A wire rope breaks through a progression of snapping wires and strands which can usually be heard clearly.

17.04.02 Inspection

The following are some suggestions to follow when inspecting chains prior to use:

- Clean the chain before inspection. Dirt and grease hide nicks and cracks
- Inspect for wear. Any portion of the chain worn by 15% should be immediately removed from service.
- Inspect for stretch. Compare the chain with its rated length or with a new length of chain. A set of slings with a master link can hang and the length can be compared.
- Inspect for cracks. If any are found replace the entire chain.
- Inspect for localized stretching. A chain can be overloaded in one specific area.
- Inspect the link welds. Lifted fins at the weld edges signify overloading.
- Inspect the chain sling master rings for any wear or stretching also check the hooks for damage.

17.04.03 Safe Working Load Rule of Thumb

A rule of thumb formula for the safe working load for a chain is as follows:

$$\underline{D^2 \times 6 = \text{Safe Working Load} : D^2 = \text{Chain Diameter Squared}}$$

The above safe working load formula is based on a lower quality decking chain. The quality of a chain will not be known in most cases and it is safer to use a formula which gives low values.

17.04.04 Chain Safety Tips

Tips to use when using chains for lifting heavy materials:

- Keep shock loading to a minimum
- Never shorten a chain by tying a knot in it, or by bolting two links together. A chain has its maximum strength with the load running in a straight line through the links.
- Only use alloy hoist slings for lifting a load. Never use decking chain for lifting. Without being familiar with chain identification the strength of the chain will be unknown.
- Never use homemade links
- Never repair links on alloy chain
- Never weld an alloy chain
- If the links of a chain bind on each other the chain is overstretched
- Always use softeners on the corners of rectangular loads. This reduces transverse loading.

17.05 COME-A-LONG

17.05.01 General

A *come-a-long* is a light, effective method of lifting or pulling a load. It is also one of the most abused pieces of equipment used; generally due to severe overloading

These hoists are factory tested at 150% of capacity. The average *come-a-long* takes less than 100 pounds of pull on the lever to lift the rated load. Therefore, two average sized workers hanging off the handle could try to lift a load 3-4 times heavier than what the hoist is rated for, and also beyond its built in safety factor.

On some *come-a-long* hoists the handle will flex when overloaded. This is meant to be a warning to back off, not to put a snipe or cheater over the handle for more leverage.

17.05.02 Typical Come-A-Long Specifications

| | ¾ Ton | 1 ½ Ton | 3 Ton | 6 Ton |
|---|--------------|----------------|--------------|--------------|
| Max Capacity | ¾ ton | 1 ½ ton | 3 ton | 6 ton |
| Standard Lift (ft) | 5 | 5 | 5 | 5 |
| Pull on Std. Lift to lift full load (lbs) | 58 | 83 | 05 | 96 |
| Net Weight (lbs) | 14 | 24 | 34 | 65 |
| Minimum Distance Between Hooks (in) | 10 ¾ | 14 ¼ | 17 | 21 3/8 |
| Lever length (in) | 21 | 21 | 21 | 21 |
| Standard Length of Chain | 5'6" | 5'6" | 11'3" | 22'9" |
| Chain Size (in) | ¼ | 5/16 | 5/16 | 5/16 |

17.06 SYNTHETIC FIBRE ROPE

17.06.01 General

Synthetic ropes have individual threads and fibres that run continuously through the rope. All synthetic ropes have a common characteristic and that is a resistance to rotting, mildew, and more strength than natural fibre rope. Generally, synthetic rope is available in the following three types:

- Nylon is the strongest rope available. It will absorb greater shock load than any other and outlast all natural fibre ropes by a wide margin. Nylon is flexible, has high abrasion resistance, can be stored wet, resists most caustics and organic solvents, and will not rot.
 1. Nylon rope is ideal for anchor lines, couplers, hawsers, tie-up lines, and safety and mountaineering ropes. It is also widely used in commercial fishing.
- Polyester is not as strong as nylon, but it is twice the strength of natural fibre. It stretches far less than Nylon but slightly more than natural fibre. It has excellent resistance to abrasion, chemicals, and weathering. Polyester ropes are recommended wherever minimum stretch, high strength and durability are needed.
- Polypropylene is the lightest, most economical and widely used rope on the market. Strength is far greater than natural. Other characteristics include: long life, ease of handling, flexibility in cold temperatures, excellent resistance to most acids and caustics, and very good impact loading. In addition, it floats.

17.06.02 Inspection

Every foot of a rope should be inspected, as it is only as strong as its weakest part. Inspect the outer surface for broken yarns,

or fibers, then untwist the strands and observe the inside. Look for a bright yellow color on natural fibers.

Broken fibres or powder inside a rope indicates the rope has been overloaded. The interior yarns of an overloaded rope will fail first. With a natural fibre rope pull out a fibre and try to break it, if it breaks easily the rope has been overloaded or affected by mildew or dry rot.

In northern regions one must be careful not to allow natural or synthetic fibre rope to freeze. This causes the separation of yarns and fibres. A frozen rope should not be disturbed until it has thawed.

Over time exposure to sunlight will deteriorate a natural fibre rope.

17.06.03 Safety Factors

Fibre rope used for rope falls, or hoisting personnel has a safety factor of 10. For other uses the safety factor is five (5).

Safety factors are used to allow for the reduced capacity of rope due to normal wear, including exposure to sun and moisture, or the extra load imposed by jerking, lifting, and stopping.

17.06.04 Breaking Strength Reductions

Knots tied in fibre rope reduce the strength by approximately 50%. An eye splice reduces the strength by approximately 20%. Fibre rope bent over sharp edges such as structural steel reduces the rope strength by 50%. Fibre rope bent around each other in a U reduces the strength by 50%.

Section 18 – Crane Safety

18.01 GENERAL

The following two types of cranes are used at TMWA: Electric Overhead Cranes (EOT) and Mobile Cranes. Electric Overhead Cranes are used at the Hydro facilities. Mobile cranes are used on many of the TMWA vehicles.

18.02 ELECTRIC OVERHEAD CRANES (EOT)

18.02.01 Safety Devices

Most cranes are equipped with certain safety devices which can be considered component parts of the crane. The following items, when installed on the crane, shall be maintained in good condition and repaired or replaced at once if failures occur:

- Warning alarms
- Hand railings
- Toe boards
- Foot brakes
- Fire fighting equipment
- Signal lights
- Gear guards
- Hoist limit stops
- Safety latches for hooks and lights

All cranes must carry “Workmen Above” signs in addition to the above rules in order to comply with established safety standards.

18.02.02 Operator Awareness Rules

The following are some rules and reminders that should be observed by certified crane operators prior to and during crane operations:

- Do not move the load or the crane unless the floor signals are clearly understood
- Signals to be given only by one person
- Start and stop slowly
- Be careful that the load does not swing and injure anyone on the floor.
- Never pick up a load greater than the capacity of the crane. (Double check the load weight and the crane capacity if unsure of either)
- Never operate when in doubt of the load condition or in doubt of the crane condition.
- When raising, lowering or moving the load, ensure that it will safely clear nearby equipment
- Make all moves slowly to prevent swinging the load
- Personnel are not permitted to ride on the hook or the load
- Ensure there is no loose object on the load
- Signal the alarm when approaching workers below
- Never stop suddenly by using either the brake or the plugging motion, except in an emergency.
- Stop on emergency signals at all times, no matter who gives them
- Never bump or move another crane when it is under repair
- Under no circumstances are side pulls permitted.
- Center the crane over the load before hoisting to avoid swinging the load as it comes off the floor
- Loads should not be swung by the crane to reach areas not under the crane
- Crane hoisting ropes must be kept vertical
- Cooperate with those hooking on the load. The operator and those on the floor are the team handling a valuable piece of the equipment. Never let it become a hazard
- Never do anything that is not safe

18.02.03

Crane Pre-Operation Inspection Check List

| Item | Ok | Needs Repair (Describe) |
|--|----|----------------------------|
| Crane signal lights and sounding devices | | |
| Loose parts and material removed from walkways and platforms | | |
| All guards in place | | |
| Limit switch cables | | |
| Main hoist cables, block and sheaves | | |
| Auxiliary hoist cables, block and sheaves | | |
| Bridge brake | | |
| Trolley brake | | |
| Main hoist limit switch | | |
| Hook latch | | |
| Controls sticking | | |
| Battery test on radio transmitter | | |
| Fire extinguisher | | |
| Check rigging equipment | | |
| Lubrication | | |
| Fluid Levels | | |
| Proper Spooling on drums | | |
| Wheels, shafts and couplings | | |
| Electrical system | | |

18.03 BOOM TRUCK SAFETY TIPS

The following are some safety tips you can follow when operating a boom truck:

- The hoist drum must have a minimum of at least three (3) wraps of wire rope.
- Know both the winch pull and the boom capacity. They will be different. The load weight must not exceed the lesser amount.
- Always know the load weight, boom angle, boom length and load radius, to avoid overload.
- Add the weight of the rigging slings and hardware to the load weight when calculating capacities.
- Do not exceed the jib rating when lifting with a jib, even though the boom is retracted.
- Rev the crane with the proper parts of wire rope needed to lift the load.
- Follow the manufacturer's method of revving the hoist blocks.
- Ensure the boom tip is positioned directly over the center of gravity of the load before hoisting.
- Ensure the jib is securely stowed before operating the boom.
- Never use the feel of the crane tipping or going light to determine the load capacity.
- Before hoisting, always make sure the load is not bolted or fastened down. Do not try to lift loads frozen to the ground.
- Never let the load be positioned to one side of the boom while lifting or lowering.
- Keep the swing movement slow to avoid side loading the boom or creating excessive load radius.
- Never use the hoist line to drag a load and never use the boom to drag a load sideways.
- Never permit anyone to ride the hook or the load.

- Never swing a load over working personnel or bystanders.
- Always keep the load as close as possible to the ground.
- Make sure any loose objects are secured on the load.
- Never try to make two lifts at once.
- If signals are required, only one person must give the signals, and the person must understand what is required.
- The operator must obey a stop signal from anyone.
- If taglines are used they must be of a non-conductive material
- Do not operate in hazardous weather conditions such as high winds, electrical storms, or poor visibility.
- Operate the controls slowly and smoothly. This protects the hydraulic system and prevents jerky and erratic load movements.
- The operator should not be at the controls with greasy hands. The control deck must be free of grease, oil, or ice to maintain secure footing.
- Always have tension on the hoist wire rope to maintain proper spooling.
- The operator should warn personnel to keep their feet away from the outriggers. The outrigger may lift up from the load weight then suddenly drop.
- Never allow the load block to pull up into the boom tip sheaves.
- Never leave the crane unattended with a suspended load.
- Never disconnect hydraulic components if they are pressurized.
- Avoid areas of hydraulic leaks as the hot fluid and high pressure can cause injury.
- All danger and caution decals must be maintained and visible on the crane.

- A very high percentage of all mobile crane accidents involve power line contact
- Always keep the recommended minimum distance between the power line and any part of the crane.

Section 19 – Accidents

19.01 MEDICAL INJURIES

The following two types of injuries are considered reportable:

- Memo Injury
- Medical Injuries

19.01.01 Memo Injuries

Memo injuries are defined as those injuries which do not require treatment by a medical professional. These injuries include, but are not limited to, first aid injuries, back injuries or repetitive motion injuries.

Memo injuries are reported using the memo injury forms. Complete the form and return it to your Immediate Supervisor. This form is kept for ninety days then discarded. If during that period the injury you received worsens, you can use the memo injury report as documentation of an ‘on the job injury’.

19.01.02 Medical Injuries

Medical injuries are those that require treatment by a medical professional. Medical professionals are doctors, nurses or EMTs. The key to understanding what constitutes medical injuries is that they require treatment and can only be effectively treated using the skills acquired by medical professionals.

19.01.03 Treatment for Medical Injuries

Initial treatment of an on-the-job medical injury can be given by any medical professional. Normally, if it is an emergency the injured employee will go to the nearest medical facility for treatment. If the injury does not require emergency care then

treatment must be provide by an approved medical provider. See your Immediate Supervisor or the Safety Officer for information concerning the current provider.

19.01.04 Reporting Medical Injuries

When an employee is injured they should report it to their Immediate Supervisor as soon as possible, following the incident. Regardless of the type of injury reporting should be immediate, or at worst before the end of the shift. If the employee is unaware of the injury until after their shift is ended the injury should be reported immediately upon returning to work.

For medical injuries the employee must complete the following forms:

- C-1: "Notice of Injury or Occupational Disease"
 1. Complete the entire top section and sign and date
- C-3: "Employer's Report of Industrial Injury or Occupational Disease" The following must be completed by the employee:
 1. Section 1 - "Employer"
 2. Section 2 - "Employee:"
 3. Section 3 - "Accident or Disease"
 4. Section 4 - "Injury or Disease"
- C-4: "Employee's Claim for- Compensation/Report of Initial Treatment"
 1. The "Employee's Claim" section must be completed and signed by the employee.

The C-4 is normally completed at the treating facility and a copy is then returned to the employee for inclusion in the reporting package. All paperwork must be completed and returned to your supervisor for completion.

19.02 VEHICLE ACCIDENTS

When a vehicle accident occurs, the driver of the TMWA vehicle should notify one of the following as soon as possible:

- Immediate Supervisor
- Glendale or Chalk Bluff Control Room
- Dispatch

The following include general rules which should be followed by all TMWA employees when they are involved in a vehicular accident:

- Never admit blame for the accident
- Never move the vehicles from their post accident positions unless directed to do so by the police or if the position of the vehicle poses a hazard to the public
- Always call the police to respond, no matter how minor the incident
- If the police cannot respond get the information from the other driver and give them your information
- Unless medical treatment is required, do not leave the scene until your supervisor or another supervisor releases you

19.02.01 Reporting a Vehicle Accident

All accidents, regardless of how minor shall be reported. Even if no visible damage is done you should notify you supervisor and let them inspect the scene. If the accident is one that will require formal reporting, use the "Auto Accident Check List."

The "Auto Accident Check List" is a yellow booklet that must be completed by the driver of the vehicle (if possible). The most current copy of the booklet is dated 7/01/01. All TMWA vehicles should have at least one booklet in the glove compartment. If one is not available there are additional copies available outside the Safety Office at Capital Blvd.

All pages of the check list (including the front cover) must be completed and returned to your Immediate Supervisor. If you do not know the answer to a section or if the section does not apply to your accident, clearly write N/A. Leaving a section blank means the document is incomplete.

Section 20 – Blood Borne Pathogens

20.01 SOURCES OF PATHOGENS

Although they are called Blood Borne, the pathogens we are discussing in this section can be transmitted by all types of bodily fluids or wastes. They may even be transmitted from one species to another. The types of pathogens you may be exposed to at TMWA include the following:

- HIV
- Hepatitis
- Hanta Virus

Exposure to any of these pathogens may occur while doing your regular jobs.

The first two, HIV and hepatitis, are commonly transmitted through contact with body fluids. This can occur when administering first aid or CPR or during clean up following an accident.

Hanta virus is another of the pathogens that can infect you during the normal course of the day. This virus is normally spread in the feces of deer mice.

20.02 PROTECTING AGAINST HIV AND HEPATITIS VIRUS

These types of viruses can infect an employee through exposure to body fluids. The most common means of entry are through body openings such as eyes, mouth or through cuts in the skin. Exposure can occur while administering CPR, first aid, or while cleaning up after an accident. The easiest way to protect oneself from infection is to use appropriate PPE.

20.02.01 PPE Use During CPR or First Aid

The first aid kits provided by TMWA come supplied with a CPR shield and latex gloves. Both of these should be used when administering CPR or first aid. In addition, eye protection should be worn. Due to the fact that TMWA provides employees with prescription and regular safety glasses they should be used.

20.02.02 Cleaning Up After An Injury

After someone is injured on the job there may be a significant amount of blood to clean up. The person doing the clean up should be armed with the same type of PPE used during the administration of first aid, which includes eye protection, impervious gloves and face protection. In addition, a disinfectant should be used prior to starting the cleanup.

The disinfectant can be a weak solution of bleach in water. Simply mix one (1) cup of bleach with one (1) gallon of water. If possible transfer the solution to a spray bottle and spray the areas to be cleaned with liberal amounts of the bleach solution. Let dry for about one hour. Then clean the area with a soap and water solution.

20.02.03 Disposal of Biological Waste

All the items used to clean the body fluids should be treated as biological waste. Any rags or paper towels used to soak up blood or other fluids should be considered biological waste. In addition, the gloves and CPR shield used should be considered hazardous waste material. These items should be bagged using a standard trash bag, and labeled as "Biological Waste". They can then be disposed of along with the regular hazardous waste pick up.

20.03 PROTECTING AGAINST HANTA VIRUS

Unlike HIV and hepatitis, the Hanta Virus is transmitted through the air rather than through contaminated fluids. The most common source of contamination is deer mouse feces. Deer mouse feces is common in many of our remote, unmanned facilities, such as wells and pump stations. In these locations dried feces can be stirred into the air as a fine powder and be taken in through normal breathing. Typically, one must have repeated exposure to large amounts of the virus in order to be infected.

20.03.01 Cleanup of a Contaminated Site

Any time that TMWA is made aware of a mouse infestation at one of its facilities a clean up of the area is facilitated using an outside service. Hired professionals typically handle the cleanup since close contact with potentially hazardous materials requires the use of respiratory protection. Because few TMWA employees are respiratory fit tested it is more conducive for an outside company to do cleanup and disposal.

Even though clean up and disposal is typically done using a contractor TMWA recognizes that at some time certain employees may be required to clean up a contaminated area. If a TMWA employee must clean up mouse droppings outside of TMWA use the following procedure:

- Create as little disturbance to the droppings as possible
- Purchase a one (1) micron disposable self-fitting respirator at the hardware store
- Make a chlorine solution by mixing one (1) cup of common bleach with one (1) gallon of water. Ensure the bleach is fresh (bleach loses its strength over time).
- Spray the area with the bleach solution and wait one (1) hour.
- Wearing the disposable respirator, sweep the droppings into a bag and dispose.

- Ensure the disposable respirator is only used only once as it will not fit properly after the first use

Section 21 – Fire Safety

21.01 FIRE PREVENTION

The most effective form of fire prevention is good housekeeping. Make sure that all flammable materials such as paper, cardboard, oils, paints, etc. are stored properly. Materials such as paints and solvents require special storage in flammable storage cabinets. Other materials, such as paper and cardboard should be stored in areas free of ignition sources. Storage areas should be kept free of clutter with minimum of three (3) feet of space between rows of stored materials.

21.02 FIRE EXTINGUISHERS

The following three (3) types of fire extinguisher are used at TMWA facilities:

- Chemical extinguishers
- Halon extinguishers
- Carbon Dioxide extinguishers

The most common of the three is the Chemical extinguisher. The Chemical extinguisher can be used on all types of fires and comes in the following three (3) sizes:

- 5 pound
- 10 pound
- 20 pound

The Carbon Dioxide and Halon extinguishers are used in areas where electrical equipment requires a specific extinguishing media that does not leave residue.

All fire extinguishers require a minimum monthly check to assure that the extinguishers are fully pressurized. Any extinguisher found to have any less than a full charge must be recharged. Once an extinguisher is used it must be recharged. Any extinguisher that needs recharged

should be given to the Safety Officer. Additional fire extinguishers are available in the Warehouse.

All TMWA fire extinguishers are checked annually by a certified technician. After inspection each extinguisher is given a color coded tag with the month, day and year the inspection was completed. Any out of date extinguishers should be taken to the Safety Department for recharging.

21.03 ALARMS AND EVACUATION

All three major TMWA facilities including Capital Blvd., Glendale and Chalk Bluff are equipped with fire alarm systems. The Capital and Chalk Bluff systems are set automatically by activation of the sprinkler system. The Glendale system must be activated manually by using one of the pull boxes located on each floor. When the system is activated a signal is sent to the fire department. You can expect a response within minutes.

Once an alarm is activated, all employees must evacuate the building and gather at one of the designated assembly areas. At least two (2) assembly areas are designated for each location and are listed in the evacuation plans of each location.

Section 22 – Safety Committee

22.01 ROLE OF THE SAFETY COMMITTEE

The goal of the Safety Committee is to support and ensure a safe work environment by addressing safety concerns through open lines of communication which promote safe behaviors and practices for all personnel.

It is the function of the Safety Committee to act as a conduit between management and staff to assure that a safe work environment is maintained at all times. This is accomplished by several of the following methods:

- Monthly meetings in which safety issues are discussed and resolutions are suggested. All employees are welcome to attend
- Semi annual inspections: A spring and fall inspection is conducted each year. Company facilities, procedures and equipment are reviewed by all members of the committee. Because of the size of our service area different areas are focused on for each inspection. This limits the committee to a three year inspection cycle in order to see all areas of the company. If you see any problems, bring them to your Immediate Supervisor or the Safety Officer—do not solely depend on this inspection

22.03 SAFETY COMMITTEE MEMBERS

The Safety Committee consists of five (5) members and the Safety Officer.

A representative from each the following departments is assigned to the Safety Committee:

- Distribution Maintenance
- Operations

- Hydro Generations and Customer Service Representative
- A rotating position from one of the areas listed above
- MPAT employee representative

Committee members are assigned for a four-year term. The committee chairman is the senior member of the committee followed by the vice chairman, second year member and finally the secretary. Each year the members rotate to the next position with the newest member taking the job of secretary.

Section 23 – Harassment and Violence in the Workplace

23.01 HARASSMENT

Illegal harassment is unwelcome conduct, whether it is verbal, physical, visual or based on an employee's legally protected status, such as sex, race, religion, national origin, sexual orientation, age, disability, veteran status, religious beliefs, or any other protected status. Illegal harassment does not depend on the victim suffering an economic or psychological injury as the result of the harassment and the harasser's conduct.

Sexual harassment does not refer to occasional compliments of a socially acceptable nature. It does, however, refer to behavior that is not welcome, that is personally offensive, that debilitates morale, and that, therefore, interferes with work effectiveness. Sexual harassment prohibited by this policy specifically includes, but is not limited to, unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature.

23.02 EXAMPLES OF HARASSMENT

- Verbal Harassment - Epithets, derogatory comments, propositioning, slurs, or other offensive words or comments on the basis of sexual orientation or gender, whether made in general, directed to an individual, or to a group of people and regardless of whether the behavior was intended to harass. This includes, but is not limited to, inappropriate sexually oriented comments on appearance, including dress or physical features, sexual rumors, code words, gossip and stories.
- Physical Harassment - Assault, impeding or blocking movement, leering, or the physical interference with normal work, privacy, or movement when directed at an individual on the basis of sexual orientation or gender. This includes pinching, patting, grabbing,

inappropriate behavior in or near bathrooms, sleeping facilities and eating areas, or making explicit or implied threats or promises in return for submission to physical acts.

- Visual Forms of Harassment - Derogatory, prejudicial, stereotypical or otherwise offensive posters, photographs, cartoons, notes, bulletins, drawings, pictures, or articles of clothing, on the basis of sexual orientation or gender. This applies to posted materials, emails, email content, material maintained in or on TMWA equipment, or personal property in the workplace.

23.03 REPORTING HARASSMENT

Any employee who feels they may have been a victim of illegal harassment is encouraged to put the offending person on notice that their activities were unwelcome, undesirable, and/or offensive. If you are unable to talk to the offending person, report your concerns to your Immediate Supervisor, the Compliance Officer, the General Manager, and/or anyone on TMWA's Management Team.

23.04 WORKPLACE VIOLENCE

Prohibited conduct on/at TMWA premises, parking areas, functions, work-sites, and in TMWA vehicles or while conducting TMWA business includes, but is not limited to:

- The threat or use of force or violence to restrain, coerce, or intimidate employees, customers, co-workers, or members of the public.
- Provocation or harassment of co-workers, customers, or members of the public
- The presence of guns, clubs, dangerous lethal weapons, and other instruments that may be used to harm others is strictly prohibited on/at TMWA premises, parking areas, functions, work-sites, and in TMWA vehicles or while conducting TMWA

business. This restriction supersedes any and all permits obtained from any issuing authority, which allow private citizens to possess, carry or conceal guns or other weapons. However, the employee's Director/Manager may authorize the use of air propelled projectile firearms for the sole purpose of TMWA pest control.

- Engaging in behavior that creates a reasonable fear of injury in another person

23.05 BEHAVIORS AS WARNING INDICATORS

All employees should be aware of the following certain behaviors that can act as a warning of a situation which can escalate to violence:

- Intimidating, harassing, bullying, belligerent, or other inappropriate and aggressive talk and/or actions
- Repeated conflicts with co-workers or outsiders (for example, vendors, visitors or customers)
- Bringing a weapon (for example, a gun, knife, club) to work, making inappropriate references to guns, or making idle threats about using a weapon to harm someone.
- Statements showing fascination with incidents of workplace violence, statements indicating approval of the use of violence to resolve problems, or statements indicating identification with perpetrators of workplace homicides.
- Direct or veiled threats of harm
- Substance Abuse
- Extreme changes in behavior

23.06 SAFETY PRACTICES

TMWA has developed and implemented several procedures which are meant to increase the security of employees at company facilities and in the field. These practices are designed to limit access to company facilities and to provide a system to alert other employees of a potentially dangerous situation which may be developing.

23.06.01 General Practices

- Gate entry is controlled by assuring that only authorized employees and contractors can access TMWA facilities. Employees who enter or leave a facility, which has automatic gates, shall stop and block entry until the gate has completely closed behind them. If a car attempts to access through the open gate the employee will allow it to pass only if the occupant is recognized as an authorized person or can show current TMWA identification. If the person tries to force their way through do not attempt to stop them. Call the Safety Officer or your supervisor immediately.
- Visitor badges are available. All visitors are issued badges when entering the secure area at corporate and must wear them while they are in the facility (badges are used only at corporate). All visitors must be accompanied by a TMWA employee at all times while they are in TMWA facilities.
- Contractors and temporary and part time employees are issued identification badges which must be worn when working at TMWA facilities. Badges must be visible at all times while on site. Contractor badges have a red stripe across the top while temporary employee badges are identified with a green stripe.

- Identification badges are also used to restrict access to certain areas of a facility. Each badge is programmed to allow access to employees and contractors based on their clearance status. In addition to controlling access the badges are used to document entry into controlled areas.
- In the customer service area of Capital Blvd. front lobby, each CSR desk is equipped with a panic button. When activated this button initiates an audible alarm and a visual blue light that is visible in the Engineering, Water Resources and Finance areas of the building. If an employee sees a blue light activated they have been trained to notify a supervisor immediately.

23.06.02 Field Practices

- The TMWA fleet is equipped with GPS devices. This allows Fleet Management to monitor the location of TMWA vehicles. Should an issue arise in which an employee or a vehicle is missing the system can be used to track the present location. This tracking capability does not relieve the employee of the responsibility of checking in with the control room when entering secured company facilities (i.e. wells, pump stations, etc).
- Field personnel are equipped with handheld radios or cellular phones while working. These devices can be used to aid in emergency response.
- TMWA water treatment facilities are manned 24 hours a day. Employees shall call into the control room before they enter a secure company location and then again when either the work is completed and/or they return to their vehicle to the yard. Additionally, TMWA personnel can contact the Department On-Call Supervisor for further assistance if needed.

If an employee has concerns regarding the safety of working at a particular site/location or in a specific situation, they should use the “buddy system” to complete the work. Although this is not practical at all times, TMWA is committed to employees working safely.

23.07 Responding to the Threat

Employees who observe or are made aware of any threat should report such conduct to their Supervisor and/or the Compliance Officer. If there is a possibility that any person may be subject to immediate harm, then employees should first contact 9-1-1 and then also contact the Safety Officer.

In the Front Lobby at Capital Blvd., the Customer Service Representatives have panic buttons which can be alarmed if they encounter a violent situation or need assistance with a customer. These panic alarms are audible and a visual blue light also flashes in the Engineering, Water Resources, and Finance areas of the building. If you see and/or hear the blue light alarm contact a Supervisor immediately.

23.07.01 Responding to Violence in the Field

Procedures used at Capital Blvd. and the treatment facilities may not be effective or appropriate in the field. While in the field employees can be isolated and must handle the situation as it unfolds.

The preferred response to violent behavior is to get out of the way and leave the area. Use your vehicle as a

shelter, lock the doors and blow the horn to attract attention.