CENTRAL ARIZONA PROJECT

SAFETY RESOURCE MANUAL

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FORWARD

Ted Cooke, General Manager

Safety is an organizational value at CAP. As a result, it is something we want you to be thinking about every day. It is not just for the big or dangerous jobs but for every job, every time. This Safety Resource Manual is intended to provide you with clear direction about CAP's safety program. I hope when reviewing it that you better understand why your safety, at work and at home, is so important.

The content of this manual was developed by the CAP Safety Vision Support Team, the CAP Environmental, Health and Safety Department (EHS) and CAP Managers & Supervisors. The rules and programs are essential to maintaining a workplace free of safety-related incidents and injuries.

Our goal for you after reviewing this manual is that you will be familiar with CAP's safety procedures and able to identify unsafe conditions that could lead to an injury, damage to equipment or interruption of work activities. It is also very important you fully understand the process for alerting others before starting work in an unsafe manner.

The expectation at CAP is that every employee, no matter the job, will make safety a value. Please review this manual. Use it as a resource and if you have any questions, talk to the EHS Department or your supervisor or manager.

By following the safe work practices outlined in the manual, and by watching out for each other, we can ensure that every employee returns home safe, every day.

SAFETY VISION SUPPORT TEAM

MISSION, CHARTER, VALUES
AND OPERATING AGREEMENTS
(REVISED: May 24, 2018)

SAFETY VISION:

CAP is a community of empowered people who trust and respect each other and choose to care about each other's safety, health, and emotional well-being in all aspects of their lives.

TEAM MISSION:

Build positive relationships within our CAP community and provide strategic direction and support to the organization as we achieve the CAP Safety Vision.

TEAM CHARTER:

- Engage all employees in forming and maintaining a safe work environment.
- Foster an empowered all-inclusive safety community.
- Drive CAP safety culture.
- Maintain the Voluntary Protection Program status.
- Raise awareness of self-reliance and promote making good safety choices.
- Support more effective team safety meetings
- Promote effective safety communication throughout CAP

CORE VALUES:

For the purpose of leading and fostering a strong, effective and caring CAP safety culture, we find it imperative to commit to our core values:

- Caring
- Trust
- Respect
- Honesty/Integrity
- Courage
- Innovation
- Commitment
- Education
- Diversity and Inclusion
- Discretion/Sensitivity
- Leadership

TEAM OPERATING AGREEMENTS:

- Membership
  - The Team will consist of 10-20 active members which include:
    - Environmental, Health & Safety (EH&S) Department Manager
    - Two Directors serving as sponsors.
    - One Communications member
    - One Risk Management member
    - The remaining members will be a proportionate cross-section of CAP
  - Members will proactively fulfill their term and recommend their replacement.
    - As a general guideline, members will serve for two years; however in some situations the Team may ask a member to serve for more than two years if there is consensus among the Team that the member will provide a special benefit to the Team. Members will seek out interested candidates for future consideration.
    - Two months prior to a members planned departure, potential candidates will be nominated and reviewed by the Team.
    - New members will be approved or disapproved by the Team by consensus and without the candidate being present.
    - Potential candidates will attend at least one Team meeting as an invited guest.
    - New members will be given a copy of this Charter and it will be discussed with them by the Chair.
    - Membership criteria will include a commitment to adopt the Team's core values and other provisions stated in this Charter.
  - Members rotating off the Team will enter "inactive" status but will remain Lifetime Members.
  - Inactive members are welcome to attend any Team meeting with prior approval from their supervisor and the Chair.
  - Inactive members shall retain a voice in the meetings but no vote.
  - Inactive members are encouraged to support Team activities and other Team functions. Membership is a privilege and is for life but can be terminated for violation of the Team's Charter.

- Roles of Members
  - Sponsors:
    - Function as Team champions and safety advocates
    - Are voting members
    - Attend all meetings
    - Include other Team members as appropriate in Management Council discussions
  - Chair
    - Selected by the Team annually in April by consensus vote
    - Must have served as Team member for at least one year.
    - Prepares agendas and facilitates Team meetings

- Vice-Chair
  - Selected by the Team annually in April by consensus
  - Assists the Chair as needed
  - Fills in for the Chair when absent
- Members
  - Will be highly visible and proactive
  - Will continuously communicate with coworkers
  - Will abide by the Team's core values and lead by example
  - Will regularly attend the monthly SVST Meetings.
  - Will attend safety meetings as available.
- Scribe
  - Maintains an accurate record of Team meetings
  - Selected by the Team by consensus
  - Functions as a member of the Team
- Subcommittees
  - SVST Chair will appoint subcommittee leaders and team members
  - Subcommittees will meet as determined by subcommittee leaders
  - Subcommittee leaders report team work to the full SVST

- Decision Making
  - Team decisions will be by consensus; we expect first and foremost, a general Team agreement. Once a decision is made by the SVST, all members shall express support for the decision to other CAP employees. Members shall endeavor to view every decision with a fresh and new perspective and invite new ideas.

- Meetings
  - Meetings will be monthly unless determined otherwise by the Team.
  - Meetings will be in an open format; the Team encourages respectful and open debate and will follow a prepared agenda.
  - Guests are encouraged to attend with prior permission of the Chair.
  - Meeting location is at Headquarters, unless determined otherwise by the Team.
  - Chair or Vice-Chair will prepare draft meeting agendas one week in advance and distribute for member review and input.
  - Members leave their titles and functional roles at the door.
  - Members will protect the emotional and cognitive safety of other Members and the integrity of the Team as a whole.
  - Technology, such as videoconferencing, will be utilized as appropriate to allow for remote participation while preserving work schedules.

CAP CENTRAL ARIZONA PROJECT	**Title:** **ENVIRONMENT, HEALTH, SAFETY & SECURITY** **Subject:** **Safety**	Guidelines Issued 12/03/98 Guidelines Reissued 10/04/10

PURPOSE

It is a condition of employment at CAP that all employees comply with the requirements of this policy as well as the CAP safety rules, programs, procedures, job safety analyses, and any other safety standard that may apply. CAP is committed to maintaining a safe working environment for employees and contractors. CAP will work diligently to reduce the number of injuries to employees, the number of lost workdays associated with on-the-job injuries, and the number of property damage incidents. ***At CAP, no job is too important and no service is so urgent that employees cannot take time to work in a safe manner***.

SCOPE

This policy applies to all CAP employees.

RESPONSIBILITIES

Management

With regards to safety, management will be accountable for the actions of direct reports, indirect reports, traveling crews, contractors, and anyone else that may be present in a work area, as well as their own actions.

Management will include safety and damage prevention activities in their own annual performance plans and in the plans of their direct reports.

Management will be held accountable for making sure that accident and injury prevention is included in all aspects of the work activities within their areas of responsibility.

Management will regularly discuss safe work practices with employees as part of the accident prevention program.

Management will provide equipment, tools, and machinery that are safe to operate. Employees will not be allowed to operate or use unsafe equipment, tools, or machinery.

Management will provide employees with training and education regarding the proper and safe use of equipment, tools, machinery, and personal protective

equipment (PPE). No employee will be allowed to operate machinery or equipment without adequate knowledge, instruction, or training to perform the task safely.

Management will ensure that each employee is wearing the proper PPE when completing job assignments.

Management will maintain effective industrial hygiene activities and a work environment safe from airborne fumes, mists, smoke, vapors, gases, dust, and noise which may impair the health and safety of employees.

Management will support consistent improvement in the physical plant, equipment, tools, and machinery at CAP so that each employee is able to perform his/her job in a safe and effective manner. The Environmental Health & Safety (EH&S) Department will assist CAP's management in the performance of periodic facility safety reviews to ensure that each facility is maintained in accordance with the safety standards required by the applicable Federal and State of Arizona regulations.

Management will investigate personal injuries and property damage incidents. Investigations will be used to gather information to eliminate the causes of the incident or injury.

Management will act on the safety concerns of staff and, if appropriate, consult the EH&S Department.

Management will maintain a program of post-accident or post-injury counseling that promotes injury prevention.

Employees

Employees share the responsibility for safety and health with management and are responsible for:

- Knowing the safety practices of their jobs
- Stopping work when unsafe conditions are present
- Working in a safe manner
- Proper use of PPE when completing job assignments
- Being properly trained for every job or activity they perform
- Inspecting, detecting, and correcting situations that could result in injuries and/or property damage
- Informing management of unsafe or unhealthy working conditions
- Complying with and encouraging other employees to comply with safety standards required by Federal and State of Arizona regulations
- Reporting safety violations and hazardous machinery, tools, equipment, and other implements to their supervisor

- Taking remedial action when possible and reporting such actions to their supervisor along with the correction taken or still required
- Participating in incident investigations, when appropriate
- Representing the interest of all employees if serving on the CAP's Safety Vision Support Team
- Including injury and damage prevention activities in their annual performance plans

Environmental, Health & Safety Department

The EH&S department will assist employees and management in working safely by:

- Preparing or reviewing and approving all safe practice standards applying to work activities at CAP
- Developing a centralized program to assist all departments in promoting and maintaining injury and loss-prevention measures
- Interpreting laws, directives, and codes dealing with injury and incident prevention
- Keeping management informed of the overall safety trends and assisting in the application of all safety/industrial hygiene programs
- Maintaining necessary records of injuries, using the data to support injury and property damage prevention activities
- Providing technical training to support safety/industrial hygiene programs and meet regulatory requirements
- Tracking and scheduling periodic medical examinations required by law (e.g., hearing tests)
- Providing training and field oversight to ensure that personal protective equipment is used properly and proper procedures are being followed
- Conducting reviews of all safety and property damage incidents to determine root cause, recommending changes in procedures or workflow, and identifying workplace hazards

CAP CENTRAL ARIZONA PROJECT	**Title: ENVIRONMENT, HEALTH, SAFETY & SECURITY** **Subject: Safety Incident Review** Guidelines Issued 3-12-03 Guidelines Reissued 5-1-19

PURPOSE

The purpose of this policy is to describe processes that will take place after safety incidents to ensure a timely and thorough systematic review that, together with coaching, corrective measures and action planning, can provide clear direction for preventing root causes. A safety incident includes work-related accidents, safety policy or rule violations, unsafe practices in the workplace, and work-related illnesses and injuries. The purpose of this policy is to promote learning that may help prevent similar incidents from occurring in the future.

All employees and management share the responsibility to maintain a safe working environment free from safety incidents. CAP believes all safety incidents are preventable. The safety review process will identify the ways the incident could have been prevented. The review process may start with the planning stage to understand if a walk-through to identify hazards occurred before the job and the procedures needed to control the hazards were discussed. It may also include discussing best body positioning, stretching, and making sure the right tools, equipment and personal protective equipment were available and used. The review process may also include determining if there are recommendations to revise work practices.

SCOPE

This policy applies to all regular and temporary, part-time and full-time employees.

RESPONSIBILITIES

Employees

All employees are accountable for enforcing safety policies, procedures, rules and standards for themselves and other employees.

All employees share the responsibility to maintain a safe working environment free from safety incidents.

All employees are responsible for accurately and timely reporting the facts of an incident to determine root cause.

Management

Each manager, supervisor and employee is responsible for gathering and recording the vital facts and circumstances surrounding a safety incident as soon as possible after it occurred. They must work with the Environmental, Health & Safety Department (EH&S Department) in identifying the root cause(s) for the safety incident. The manager and or the supervisor are responsible for the development of a coaching plan when required following the incident, or for making the necessary adjustments to processes, procedures or equipment.

Managers and supervisors are responsible for administering this policy uniformly.

Safety and Health Department

The EH&S Department is responsible for the prompt review of all safety incidents.

The EH&S Department shall use an accepted method of systematic review that provides for analysis of the incident in finding the root cause(s).

The safety incident report will recommend methods to prevent reoccurrences.

Safety Vision Support Team (SVST)

The incident report will be provided to the SVST upon completion. The Manager of the EH&S Department will be available to discuss the incident with the SVST upon request.

GUIDELINES

1. All employees must interact efficiently and carefully with the EH&S Department to determine all the facts surrounding the safety incident. A safety review is primarily an opportunity to learn what happened to prevent any further reoccurrence.

2. Managers and supervisors are responsible for keeping a safety incident area as intact as practical until a thorough review occurs.

3. Depending on the specific facts of a safety incident and an employee's behavioral and performance history, managers or supervisors may provide corrective action, including coaching, for an employee after a safety incident.

REFERENCES

Corrective Action Policy

Vehicle Accident Review Policy

CAP Accident/Injury Investigation Booklet

CAP Coaching Process, References, Analysis and Worksheet

Main TOC

SECTION 2

SAFETY RULES

1.0 GENERAL SAFETY RULES and PROGRAMS

1.1. Stop Work Authority: Any employee who witnesses an unsafe condition, act, or potential situation that poses an immediate risk to life, limb, or CAP property has the authority and the responsibility, regardless of position, to: Order all employees, visitors and contractors who are exposed to an unsafe work activity to cease the unsafe work activity and remove themselves from danger. The employee shall also:

1.1.1. Report the unsafe condition to the supervisor, or manager.

1.1.2. If the supervisor, or manager fails to take action to rectify the dangerous situation the employee must contact the Environmental, Health & Safety (EH&S) Department for resolution of the problem. The EH&S Manager or his designee has the authority to order that work be suspended until the dangerous condition is resolved.

Examples of an immediately dangerous condition include (but are not limited to): employee entry into a permit- required confined space without a permit and attendant, or an employee ignoring a clearance tag or lockout.

1.2. Employee Responsibility: Each employee has a responsibility for his/her own safety, the safety of other employees, and the safety of the public. Therefore:

1.2.1. Employees will be expected to learn the general rules, procedures, programs and departmental safety rules applicable to their job.

1.2.2. Employees will abide by the safety rules and safe work practices.

1.2.3. Employees will not take "short cuts" or experiment with the safety aspects of their job.

1.2.4. Employees will not compromise safety for production or convenience.

1.2.5. All employees will report unsafe working conditions to their supervisor.

1.2.6. Employees who abuse safety rules, programs, and procedures will be subject to corrective action under the CAP corrective action policy. Examples of abuse include but are not limited to:

- Damaging personal protective equipment and then refusing to work because of a lack of PPE.
- Lying to the EH&S Manager or his designee in a matter pertaining to health and safety at CAP.

- Falsifying reports, documents, or other materials that are related to the needs of the EH&S Department.

1.2.7. Employees must report all injuries and accidents promptly to their immediate supervisor and complete the required forms pertaining to the incident as soon as possible.

1.3. Management Responsibility: A safe workplace ensures that CAP employees' health and safety is not compromised during the performance of their job. Second, a safe working environment ensures efficiency over the long run, and protects CAP from costs of occupational injury and disease. Therefore:

1.3.1. Managers are expected to ensure that all safety rules, policies, and procedures are followed as an integral part of the performance of their job.

1.3.2. Managers must hold all supervisors to the commitment for safety as outlined in safety rules 1.3.1 through 1.3.6.

1.3.3. Managers must ensure that proper training in safety is provided to all employees in an expedited manner.

1.3.4. Managers and Supervisors must not, under any circumstances, take retaliatory action against employees for participation in the safety program.

1.3.5. Any person with supervisory responsibility who retaliates against an employee for a protected safety activity will be subject to corrective action per the CAP corrective action policy.

1.3.6. Protected safety activities include:

- Reporting an unsafe working condition.
- Requesting safety training or clarification of a procedure that the employee is unsure is safe to perform.
- Participating in the safety committee
- Refusing to work in a manner that clearly poses a danger to employee safety and health.
- Refusing to violate a safety rule.

1.4. Safety Programs: Employees are required to comply with all safety and health programs adopted by CAP including, but not limited to the following:

1.4.1. Confined Space Program

1.4.2. Forklift Program

1.4.3. Respiratory Protection Program

1.4.4. Hearing Loss Prevention Program

1.4.5. Hazardous Energy Control Program

1.4.6. Blood borne Pathogens Program

1.4.7. Lead in Construction Program

1.4.8. Personal Protective Equipment Program

1.4.9. Hazard Communication Program

1.4.10. Electrical Safety Program

1.4.11. Fire Safety Program

1.4.12. Industrial Hygiene Program

1.4.13. Fall Protection Program

1.4.14. Asbestos O & M Program

1.4.15. Thermal Stress Program

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2.0. PERSONAL PROTECTIVE EQUIPMENT

2.1. General Guidelines: Only personal protective equipment (PPE) approved by the EH&S Department will be used by CAP employees. Employees must use PPE for the purpose and manner intended. PPE must be used where conditions of the job require and in accordance with rules, instructions, or directions from the supervisor. Anyone entering designated areas or working near others wearing required PPE must also wear the required PPE. PPE must be kept in good order. Damaged or defective PPE must be replaced immediately.

2.2. Workplace Hazard Assessment: Prior to issuing PPE, the department manager or supervisor, must ensure that an appropriate assessment of hazards of the job tasks has been performed and the correct PPE has been issued. This assessment must be documented in a manner specified by the EH&S Department. (Reference the CAWCD Personal Protective Equipment Program.)

2.3. Employee Training: Under no circumstances will an employee be exposed to a hazard without proper training on the use of PPE to protect him/her from that hazard. This training must be provided under the guidance of the department manager, supervisor, or work team leader. The trainer must be qualified to perform the required training. The training must include (at a minimum):

- ✓ The hazards the employee is exposed to that require the PPE
- ✓ The areas or conditions on the job site that require PPE
- ✓ The limitations, maintenance, and care of the PPE
- ✓ The proper method of donning, wearing, and removing the PPE.

2.4 Altering Personal Protective Equipment: Employees must not alter or use altered PPE.

2.5 Hearing Protection: Hearing protection is required in areas where posted or when operating equipment that is designated as required hearing protection. Hearing protection must be approved by the EH&S Manager or his designee. (Reference the CAWCD Hearing Loss Prevention Program).

2.6. Protective Chaps: Employees who operate chain saws and other similar power tools must wear protective chaps that meet current U.S. Forest Service requirements.

2.7. Gloves: Use appropriate hand protection when hands are exposed to:

- ✓ skin absorption of harmful substances.
- ✓ cuts, lacerations or abrasions
- ✓ punctures
- ✓ chemicals

- ✓ temperature extremes

Employees must be made aware of appropriate storage and replacement of gloves that are issued as chemical protective clothing. (Reference the CAWCD Personal Protective Equipment Program.)

2.8. **Hard Hats**: All employees who have potential exposure to head injury as a result of their assigned work or working environment will be issued a company-approved hard hat. The hard hat will meet the requirements of ANSI Z89.1.

Hard hats are required to be worn at all times and in all areas in and around pumping plants. This includes switchyards, intake decks, outlet works, and other equipment associated with the plant. All visitors, including tour groups, are required to comply.

Exceptions: Hard hats are not required in the following areas at pumping plants:

- ✓ Offices, control rooms, bathrooms, break areas, and designated walkways between these areas.
- ✓ At the start or end of the work shift as long as there is no work activity occurring.
- ✓ When the supervisor has determined that wearing a hard hat inhibits the performance of the task.

In addition to pumping plants, employees must wear a hard hat in any location where there is a potential exposure to overhead hazards or a danger of flying or falling objects.

Baseball or similar type caps must not be worn under hard hats. Only headwear that does not interfere with fit and function of the hard hat can be worn. (Example: Smooth welding caps or soft skull caps free of buttons, bills and protruding seams.)

Altering hard hats or hardhat suspensions is prohibited.

Wearing hard hats backwards is not recommended but is permitted provided the suspension is worn in the manner approved by the manufacturer. The adjusting mechanism for the suspension must not be worn to the front.

Bump caps are not permitted as a substitute for hard hats.

Regardless of the location, all employees must have their hard hat on site and readily available at all times. An employee who has not been issued a hard hat, but who visits a pumping plant or other location where a hard hat may be required, should obtain one prior to the visit (see Material Control & Distribution) or check with the location supervisor for a visitor's hard hat.

2.9 **Eye Protection**: Company approved (ANSI Z-87) eye protection must be worn in designated areas. Employees must wear sufficient protective eyewear (i.e. foam lined safety glasses) when working in areas where wind, dust, and other foreign matter may constitute a hazard or where chemicals may cause a splash, mist or vapor hazard. Eye protection must be approved by the EH&S Department as appropriate for the hazard that is present. (Reference the CAWCD Personal Protection Equipment Program.)

Employees wearing contact lenses when working in areas where wind, dust, and other foreign matter may constitute a hazard or when chemicals may cause a splash, mist, or vapor hazard must wear goggles.

Employees must not wear dark lenses in conditions of normal indoor lighting, or insufficient outdoor lighting except when warranted by an operation requiring darkened lenses.

Electricians, Electrical Technicians, Relay Technicians, and Electrical Engineers including Electrical Maintenance Engineers may not wear wire (conductive) metal glass frames when within a touch boundary (NFPA 70E). However, non-conductive glasses or goggles may be worn over prescription wire frames.

2.10. **Protective Footwear**: In circumstances where employees are exposed to hazards to the feet, the employee must wear ASTM F2413-05 (formerly ANSI Z-41) approved footwear.

All employees working in CAP facilities such as pumping plants, check structures, vehicle maintenance shops, machine shops, the weld shop and canal areas must wear ASTM F2413-05 approved footwear.

For employees that routinely travel to the field or work on the canal in areas of uneven terrain the footwear must be of a boot style that provides ankle support and has a rugged tread on the sole. (Reference the CAWCD Personal Protective Equipment Program.)

Electrical hazard (EH rated) boots and shoes are required to protect the wearer from accidental contact with electrically energized objects containing circuits of 600 volts or less under dry conditions. These shoes are secondary protection on surfaces that are substantially insulated.

2.11. **Face Shields**: ANSI Z-87 approved face shields must be used in addition to approved eye protection during operations that create a hazard from sparking or flying debris, chemical splash, or other hazards to the face. (Reference the CAWCD Personal Protective Equipment Program.)

2.12. **Respiratory Protection**: Appropriate respiratory protection is required in areas with air- borne contaminants if engineering and/or administrative controls are not

feasible or are being designed but are not functional. (Reference the CAWCD Respiratory Protection Program.)

2.13. Minimum Wearing Apparel: All employees who work outdoors must wear, as minimum protection, pants long enough to protect from environmental and physical hazards, and sleeved shirts with a minimum 4-inch sleeve. Cutoffs, tank tops, or modified shirts are not acceptable. Apparel must protect where irritants or toxic substances may come into contact with skin or clothing. CAP personnel may wear shorts if their job description is associated with Protective Services.

2.14 Protective Vest: Employees working on or adjacent to public roadways, on CAP roadways and property within 100 feet of operating mobile equipment must wear a bright orange/green T-shirt or a reflective vest that complies with the ANSI/SEA 107 Standard.

Vests will need to be maintained in a manner that ensures that the quality of the retro reflective trim and brightness of the vest is achieved to enhance visibility. Reflective clothing that outlines the chest, arms, and legs is most effective for drivers and operators to recognize and respond quickly to a human figure. (Note: Vests that do not comply with ANSI/ISEA should be discarded.)

(TOC)

3.0. MOTOR VEHICLE OPERATION

3.1. Purpose and Scope: CAP vehicles are a familiar sight to the people of Arizona. These rules are set forth to promote considerate and courteous driving as a policy of CAP employee-drivers. The rules of this section apply whenever:

(a) The employee is operating CAWCD owned vehicles.

(b) The employee is operating a privately owned vehicle being used for CAP business.

3.2. Defensive Driving: Drivers are urged to practice "defensive driving" at all times. Defensive driving means avoiding accidents by anticipating other persons' actions (e.g. a person stepping out between parked cars, a car may pull out from a curb without warning, a driver nearby being impaired). Appropriate following distance (minimum of two seconds) must be maintained. All drivers must maintain a safe and prudent speed while driving on company business. (Note: Safe and prudent speed may be less than the authorized speed limit if adverse driving conditions exist.)

3.3. License and Testing: CAP employees whose job description requires them to drive a vehicle must have in their possession a valid operator's license or commercial driver's license (CDL), as required by the State Motor Vehicle Code.

3.4. Knowledge and Compliance with Laws: CAP employee drivers must be familiar with and obey the State Motor Vehicle Codes, local traffic rules and ordinances, and parking restrictions.

3.5. Condition of Driver: No driver must drive a CAP vehicle while his physical or mental condition is such as to impair his normal judgment and ability. Therefore:

3.5.1 No employee must drive a CAP vehicle or a privately owned vehicle on CAP business while impaired by illness.

3.5.2 No employee must drive a CAP vehicle or a privately owned vehicle on CAP business while in a state of emotional distress or distracted by such things as arguments, significant radio traffic, or passengers.

3.5.3 Under no circumstances must a CAP employee drive a CAP vehicle or a privately owned vehicle on CAP business while under the influence of alcohol, illicit drugs, or prescription/non-prescription drugs that influence a driver's ability.

3.6. Unauthorized Drivers: Only authorized CAP employees must drive CAP owned vehicles. (Reference CAP vehicle use policy)

3.7. Riders in Vehicles: Riders must not distract the vehicle operator. Passengers (including the vehicle operator) must not extend their limbs or heads outside of

the vehicle while the vehicle is in motion. Passenger(s) must comply with the instructions of the operator provided that such instruction does not constitute a safety hazard. Passenger(s) must be seated in properly secured seating as provided by the vehicle manufacturer.

3.8. **Entering Street from Company Property**: All vehicles must come to a complete stop at all exits from Company property and must remain stopped until conditions are safe to proceed into the street or roadway.

3.9. **Turning, Stopping and Signaling**: All turning, stopping, changing of lanes and other movement of vehicles in traffic must be done in accordance with the State Motor Vehicle Code, and the appropriate signals must be given as described therein.

3.10. **Right of Way**: Drivers must drive courteously at all times and must yield the right of way to all pedestrians and other drivers if there is any question as to which vehicle has the right of way.

3.11. **Vehicle Restraint Systems**: Seatbelts must be provided for all vehicle occupants. Seatbelt use is mandatory for both the vehicle operator and all passengers. The operator will not move the vehicle until all occupants have seatbelts secured.

Employees must not deactivate or otherwise defeat the use of other restraint systems on CAP vehicles. (Example: air bags).

Exception: If the restraint system creates a hazard to the operator and/or passengers, per the vehicle manufacturer's recommendation(s), the Safety Manager may allow a waiver of this rule. (Note: the restraint system must be returned to the active status following use by the operator and/or passenger allowed a waiver of this rule.)

3.12. **Pre-Trip Inspection:** A brief inspection of and around a vehicle or trailer can reduce the chance of an accident or other incident. Accordingly:

3.12.1 All CAP employees must walk around their vehicle prior to every departure no matter the location. The purpose of a vehicle walk around is to make a general observation to ensure there are no nearby people or obstacles that might be hit upon moving the vehicle. It also provides an opportunity to identify a flat tire or other concerns, including any vehicle damage not previously noted.

3.12.2 Further, employees must conduct an inspection of their vehicle prior to the first departure of the day. The inspection should follow the laminated vehicle inspection card located in the vehicle log book, to include checking the following:

- Motorola radio, headlights, brake lights, turn signals, and hazard lights for operability;

- Condition of tires, windshield, windows and mirrors for excessive wear or cracks;

The walk around and inspection are the responsibility of both the driver and passengers.

Note: When operating a vehicle covered under the State of Arizona Commercial Vehicle codes, other items may require inspection to ensure safe operation of the vehicle. Non-working or missing items must be repaired or replaced prior to operating the vehicle.

3.13. Loose Tools / Items: Transporting loose tools or other equipment in the passenger compartment unrestrained is prohibited. Managers and Supervisors should review the vehicle housekeeping requirements with their employees, identify vehicles that need barriers installed, and arrange with the Vehicle Shop for the installation of barriers in those vehicles where the transportation of loose tools and equipment within the passenger compartment is required.

3.14. Damage and Service Reports: Employees must report any damage to CAP vehicles promptly to their supervisors. Any indicator light or abnormal gauge reading must be reported promptly for appropriate servicing of the vehicle.

3.15. Clearing Obstructions: Vehicle drivers must not park within 15 feet of any railroad track. The driver must not park a vehicle within any traveled portion of a roadway unless the proper warning to approaching traffic is provided.

3.16. Vehicle Movement: Drivers should plan their routes to avoid U-turns and backing into traffic. In situations where the driver must make turns in limited areas, back into traffic, or make other difficult maneuvers, the passengers must assist the operator in a manner that does not present additional hazard to the passenger(s).

3.17. Remote and Primitive Road Travel: Employees who drive in remote areas should ensure that they depart their duty station with at least a gallon of potable water per passenger. Operators should plan routes that minimize travel in remote areas and on primitive roads. More developed and frequented routes should be favored where available and feasible. Caution must be taken during flash flood conditions to avoid crossing of flooded areas, streams and washes.

3.18. Vehicle Accidents: Employees must make prompt report of an accident involving a CAP vehicle to the Protective Service Department and their Manager and/or Supervisor by the quickest means available. The CAP Occurrence and Damage Report Form must be completed as soon as possible and forwarded to the Risk

Management Administrator.

3.19. Disabled Vehicles: Disabled vehicles should be reported to the Vehicle Maintenance Supervisor and the employee's manager/supervisor by the quickest means available. The operator and/or passengers should exercise all means available to protect the vehicle and its contents from theft and vandalism.

3.20. Radio/Cellular Phone Usage: Except in a life-threatening emergency, the use of cellular phones, company radios or other electronic messaging device by the operator while the vehicle or equipment is being operated is prohibited. This includes the use of the device for conversing, texting, tweeting or any other similar activity that may distract the operator.

Prior to using a cell phone or other device, the operator of a company vehicle, equipment or a private vehicle being used for company business must pull off the road and stop the vehicle in a safe location prior to initiating (dialing a number) or answering a call or electronic message.

Exception: During the operation of heavy equipment such as a crane, and where visibility is restricted, the equipment operator may use a radio or similar device to communicate with a signal person to ensure safety of operations.

3.21. Unattended Vehicles: Unattended vehicles must be locked and left in a secure location.

Exception: When leaving a vehicle running but momentarily unattended (such as when opening or closing a gate), the vehicle must be left in park with the parking brake set.

3.22. Backing: In order to avoid accidents, injuries and equipment damage, the utmost care and attention must be utilized when operating vehicles and equipment in reverse (backing). Accordingly, employees must comply with the following whenever safe and possible to do so:

The first choice when parking a vehicle or equipment should be to pull through the parking spot so that the vehicle/equipment is facing forward, eliminating the need to back out of the spot when leaving. If this is not possible, then one of the following options must be selected:

3.22.1 Back the vehicle/equipment into the parking spot, eliminating the need to back out of the spot when leaving, or

3.22.2 Park the vehicle/equipment head-in (facing forward) and take one of the following actions:

3.22.2.1 Prior to backing out, make a 360 walk around the vehicle or equipment and observe that all is clear, or

3.22.2.2 Place an orange cone behind the vehicle after it is parked. Prior to backing out, remove the cone and observe that the area is clear, or

3.22.2.3 Ask that a passenger or other individual act as a spotter during the backing of the vehicle/equipment.

3.23. **Dust Storms**: During a dust storm, reduce speed and turn on driving lights. If dust becomes so intense that visibility is less than 300 feet, pull off the roadway as far to the right as possible. (Do not stop on the traveled portion of the roadway.) Stop and turn off driving lights.

3.24. **Reflective Tape**: Reflective tape must be installed on the back of all CAP vehicles.

3.25. **Speed Limit on O&M Roads**: A reasonable and prudent speed, depending upon conditions (weather, visibility, road conditions, and obstructions), shall be maintained at all times, but shall not exceed 35 MPH outside of Maricopa County, and 15 MPH within Maricopa County. (The 15 MPH limit is for dust control purposes/regulations).

3.26. **Posting road obstructions**: Work activities that close a section of the O&M road require posting of the closure at both gate locations. Additional posting is required 150' upstream and downstream of a complete road obstruction.

(TOC)

4.0. CRANES and HOISTS

4.1. **Authorized Employees**: Only authorized employees are permitted to operate cranes, hoists, and mechanical lifting/pulling devices. Before authority is granted, employees must be trained in the rules and procedures regarding the equipment's operation and use, including instructions and rules supplied by the manufacturer. (Operators will demonstrate proficiency by successful completion of a written test and skills assessment under the direct supervision of a qualified operator before being considered authorized to use the hoisting equipment.)

4.2. **Inspection**: All hoisting equipment and rigging must be inspected daily, by the operator, before use and periodically as required. If defects are found, they must be corrected or the equipment must be removed from service. The record of inspections to hoisting equipment must be maintained at the facility for a period of 2 years following a subsequent inspection and must be available for review upon request.

4.3. **Safe Load**: The proper loading and handling of a load is critical to the operation of a crane. To ensure that the load is handled in the correct manner the following rules will apply:

4.3.1. Do not overload hoisting and rigging equipment. The operator is responsible to ensure that the weight of the lift including the load and rigging does not exceed the capacity of the hoisting equipment.

4.3.2. Do not side-load or drag a load with hoisting equipment. Center the load under the lifting equipment. In those circumstances where the load is not directly under the lifting equipment a method must be used that will not place side load pressure against the crane rope spool and guides. (E.g. fixed point blocking.)

4.3.3. Raise and lower the load steadily and gradually and do not drop or jerk the load or tackle.

4.3.4. On all capacity or near capacity loads, the hoist brakes should be tested by returning the master switch or push-button to the OFF position after raising the load a few inches off the floor. If the brakes do not hold, set the load on the floor and do not operate the crane. Report the defect to the supervisor in charge of the crane.

4.4. **Groundman**: When a crane or similar unit is in use, a groundman will be assigned to assist the operator in situations where vision is obscured or other hazards are present. The groundman is responsible for directing and safeguarding all machine movements. Before signaling boom or machine movement, the groundman must see that the load, cab or boom will not come into contact with nearby wires, structures, or other objects or persons.

4.5. **Crane Operator**: The crane operator is responsible for the safety of the crane and for the safety of employees working in the vicinity. The operator must have the authority to refuse to move loads until the safety of all personnel and equipment has been assured.

4.5.1. The operator will only take signals given by the groundman, unless the signal is the stop signal.

4.5.2. At no time must loads be left suspended without an authorized crane operator at the controls.

4.5.3. The operator must not operate a crane while impaired or distracted. No operator must be permitted to operate a crane for more than 12 hours in any 24-hour period.

4.6. **Hand Signals**: Hand signals must be in accordance with American National Standards Institute (ANSI) B-30.2 for overhead and gantry cranes and (ANSI) B-30.5a for crawler and truck boom cranes. A copy of these signals must be posted in a location readily available to the operator during the lifting operation.

4.6.1. The person giving signals must:

- ✓ Make sure signals can be plainly seen,
- ✓ Give signals clearly so they can be understood.

4.6.2. The operator receiving signals must:

- ✓ Stop the movement of the load if he does not understand the signal received.
- ✓ Stop the movement of the load if the person giving signals disappears from view.

4.7. **Emergency Stop Signals**: Anyone can give emergency stop signals. The crane operator must immediately recognize and act upon any stop signal or any other motions or movements that might indicate such action is necessary.

4.8. **Positioning**: Those persons working in the vicinity when cranes or other hoisting devices are in use must:

- ✓ Positions themselves where they cannot be caught between the load being handled and any obstructions,

- ✓ Stay clear from a load being suspended,

- ✓ Not be under the crane boom or similar machine when it is lifting or suspending

the load,

- ✓ Not stand near or in line with a cable, rope or chain under tension or one that might be tightened at any moment,

- ✓ Not walk in the path of the load being handled by the crane or hoist.

4.9. Raising Personnel: Use of a crane to hoist employees is ***prohibited*** except where the erection, use, and dismantling of other means of reaching the work area (i.e., scaffolding, aerial lift, etc.) would be more hazardous or is not possible. Consult with the EH&S Department prior to such operations.

4.9.1 All personnel lifts using a crane must comply with the requirements of the OSHA standards found at 29 CFR 1926.1431, including requirements for fall protection.

4.9.2 Employees occupying the personnel platform must utilize a personal fall arrest system. The system must be attached to a structural member within the personnel platform. Exception: when working over water, a personal fall arrest system is not required. However, the requirements of 29 CFR 1926.106 must be followed.

4.10 Load Control: The crane operator must control the movement of the load in a manner as to ensure the safety of other personnel in the vicinity of the load. The load must not be handled in a manner that will damage the load or adjacent structures or material.

4.10.1 Loads must not be moved if swaying and turning excessively. A load that is suspended or being lifted should be pushed instead of pulled. Where necessary, use tag lines or push sticks to prevent uncontrolled movement.

4.10.2 Hands must not contact wire rope or sheaves on hoisting equipment with a load attached unless absolutely necessary, and then only after notifying the operator. (Note: Gloves must be worn.)

4.10.3 Outdoor operations involving cranes must be suspended when wind speeds exceed 25 mph, unless the manufacturer rates the crane for higher wind speeds.

4.10.4 Suspended loads must not pass over any individual or come into contact with equipment or objects along the path.

4.10.5 Check to make sure that the load is lifted high enough to clear all obstructions and personnel when moving the bridge or trolley.

4.10.6 Never rely on the load limit devices, if installed, to ensure that maximum loads are not exceeded. These devices are not intended to be used as a production control.

4.10.7 During inspection, repairing, cleaning or lubricating, a warning sign or signal should be displayed and the main switch should be locked in the OFF position. This should be done whether the crane operator or others are doing the work. The crane operator should remain at the controls for the duration of the task unless instructed by the supervisor.

4.11 Power Loss: In the event of loss of power, return all controls of the crane to the OFF position.

4.12 Emergency: EMERGENCY SHUT DOWN PROCEDURES FOR OVERHEAD CRANES: If possible, lower and secure the load. Switches must be placed in the neutral position, and the operator must carefully evacuate the cab according to plant Emergency Evacuation Procedures.

4.12.1 Never attempt to close a switch that has a DO NOT OPERATE TAG or has been locked out.

4.12.2 Do not attempt repairs on the crane unless authorization from the supervisor has been obtained.

4.12.3 When traveling, sound the alarm frequently if not automatically actuated.

4.12.4 A fire extinguisher (6ABC or higher) must be accessible to the crane operator.

4.12.5 Prior to performing a critical lift a safety hazard analysis must be prepared and all personnel involved instructed as to the specifics of the lift.

4.12.6 Non-purchased (shop built) lifting devices must be approved as to compliance with applicable standards, by the CAP Engineering Department, prior to use.

4.13 Mobile Cranes: The following rules are specific to the operation of the mobile cranes and must be complied with during their operation:

4.13.1 The rear-swing radius area of the rotating superstructure of a mobile crane must be barricaded in a manner that physically prevents a person from entering the danger zone.

4.13.2 Mobile cranes, hoists, or other similar lifting devices used near energized lines or equipment must not operate within the approach distances as specified by OSHA Standard 29CFR1910.333.

- ✓ Voltages to ground 50kV or below- 10 Feet

- ✓ Voltages to ground over 50kV- 10 Feet plus 4 inches for every 10kV over 50kV

Note: If the potential exists for the boom to contact energized electrical parts a positive means, as approved by the Electrical Safety Department, must be used to prevent entering the approach distance or the line(s) must be de-energized and grounded.

Consideration must be given to the following: The lifting device should be properly grounded, insulated, isolated, or considered as energized.

Equipment in transit: Clearances under energized overhead high voltage lines –

- ✓ Up to 50KV: 4'

- ✓ 50 KV up to & including 345KV: 10'

4.13.3 Trucks on which the boom is elevated must not be moved except under the immediate direction of a person designated to guide the move. This individual will give his/her undivided attention to the movement. Under no circumstances may a mobile truck crane be moved with the boom under load.

4.13.4 The outriggers or other stabilizing devices must be in the proper position prior to commencing a lift. Wooden pads must be used under the outrigger floats as required.

4.13.5 Crane travel on public highways will be in accordance with all applicable motor vehicle rules and regulations.

4.13.6 Inspection, servicing, and housekeeping are critical to the proper performance of a mobile crane. Therefore it is the responsibility of the operator to ensure that the inspections, and servicing are current per the manufacturer's guidelines and that the crane is kept free of all debris and fluids that may be a hazard to the operator and other personnel.

4.13.7 Loads in excess of 75% of the rated capacity of the crane (critical lift)

require a lift plan approved by Maintenance Engineering prior to commencing the lift.

4.14 Overhead Cranes: The following rules are specific to the operation of overhead cranes and must be complied with during their operation. CAP personnel are required to follow CAP Policy titled, " Overhead Crane/Hoist Inspection and Training Overview," as well as OSHA's 29 CFR 1910.179 and the ANSI/ASME B30.2 standards.

4.14.1 In accordance with ASME B30.2, new, reinstalled, altered, repaired and modified cranes must be load tested prior to initial use by a qualified person. Load testing of altered, repaired, and modified cranes may be limited to the functions affected by the alteration, repair, or modification as determined by a qualified person. The replacement of load chain and rope is specifically excluded from this load test; however, an operational test of the hoist must be made, in accordance with ASME B30.2, prior to putting the crane back in service.

4.14.2 In accordance with ASME B30.2, the load test must not be less than 100% of the rated load of the crane or hoist whichever governs; or not more than 125% of the rated load of the crane or hoist.

4.14.3 Pendant operated cranes must have the directions of travel clearly marked on the pendant controller and the under frame of the crane.

4.14.4 The pendant control must be inspected to ensure that the support cable is in place and carrying the weight of the pendant.

4.14.5 The controller must be checked for proper response prior to using the crane for material lifting.

4.14.6 The operator of a cab operated crane must not allow the crane to free wheel and must not use the wheel stops as the means of stopping the crane movement except in an emergency.

4.14.7 The operator of a cab controlled overhead crane must ensure that the exit pathway is unobstructed prior to operating the crane.

4.15 Wire Rope: Wire rope used during a lift is a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.15.1 Different sizes of wire ropes are used as suspension cables, boom cables, guy wires, hoisting and other devices.

4.15.2 Determine the safe working load for each size of wire rope by comparing

the current manufacturer's specifications of working load strengths to the wire rope's diameter and the design and materials used in the rope's construction. All wire rope will be of a domestic make and classification.

4.15.3 Visually inspect all running ropes in use once every working day. Thoroughly inspect all ropes in use at least quarterly. Note any defects, such as those described below to determine whether using the wire rope would be unsafe.

- ✓ Rope diameter below nominal diameter because of:
  1. Loss of core support
  2. Internal or external corrosion
  3. Stretch or wear of outside wires,

- ✓ A number of broken outside wires, or inside valley wires, with large concentrations of broken wires distributed throughout,
- ✓ Worn outside wires,
- ✓ Corroded or broken wires at end connections, Corroded, cracked, bent, worn or improperly applied end connections,
- ✓ Severe kinking, crushing, cutting, or un-stranding.

4.15.4 If any of the following conditions exist, replace the wire rope:

- ✓ In running ropes, six or more randomly distributed broken wires in one lay or three or more broken wires in one strand in one lay,
- ✓ Wear of one-third of the original diameter of outside individual wires,
- ✓ Kinks, crushing, bird caging, or any other damage that distorts the wire rope structure,
- ✓ Evidence of any heat damage,
- ✓ Nominal diameter reduced by more than:
  1. 3/64 inch for diameters up to and including 3/4 inch.
  2. 1/16 inch for diameters 7/8 inch to 1-1/8 inches
  3. 3/32 inch for diameters 1-1/4 inches to 1-1/2 inches,

- ✓ In standing ropes, more than two broken wires in one lay in each section beyond end connections,

- ✓ For any wire rope, one or more broken wires at an end connection. For this type of break, if the wire rope is long enough, cut off 6 to 8 feet of rope from the end to make a new connection,

- ✓ One or more broken wires in a running rope, with breaks in the valleys between strands.

4.15.5 Torch cutting of wire rope used for material lifting is prohibited.

4.15.6 Wire ropes must be stored and utilized in a manner that prevents deterioration or damage from rust, twisting, and cutting. Wire rope must be maintained in a well- lubricated state.

4.15.7 Securely fasten one end of the wire rope to the drum or reel. Do not allow the wire rope to fully unwind, at least two full turns must always remain on the drum or reel. Securely fasten the lifting or dead end of the wire rope to the block, device, or reel with a tapered socket or an oval thimble.

4.15.8 Use wire rope sockets on all hoisting lines at the bucket or hoist end, where facilities permit proper application. Otherwise, use the proper size of thimbles and apply:

- ✓ Three properly sized clamps on 5/8 inch wire ropes and under,
- ✓ Four clamps on 3/4 & 7/8 inch wire ropes, inclusive,
- ✓ Five clamps on 1 inch wire ropes, inclusive,
- ✓ Six clamps on 1-1/8 inch and larger wire ropes.

4.15.9 Make sure clamp spacing is no less than six times the diameter of the wire rope. Apply U-bolt over dead end of the wire rope. Live end of the wire rope rests in the saddle. Clamps must be re-torqued a second time after lifting first load.

4.16 Rigging: Rigging used during a lift is a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.16.1 Use slings, wire rope, chain, or synthetic fibers that are certified to handle the load.

4.16.2 Rigging must be inspected daily prior to use. Sling identification tags must be in place and legible as to the capacity of the sling.

4.16.3 Shackles used for hoisting must be of forged alloy steel and must be of the screw type or bolt type without wear or damage.

4.16.4 Remove shackles from service if they are bent, distorted, worn in the crown or pin by more than 10 percent of their original diameter.

4.17 Wire Rope Slings: Wire rope slings used during a lift are a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.17.1 Wire rope slings must be checked for the following prior to use:

- ✓ Distortions of the wire rope such as kinks, crushing, un- stranding, birdcages, main strand displacement or core protrusion,
- ✓ General corrosion,
- ✓ Broken or cut strands,
- ✓ Number, distribution, and type of visible broken wires,
- ✓ Loss of wire rope diameter in short rope lengths or unevenness of outer strands.

4.17.2 Wire rope slings must be replaced if:

- ✓ Ten randomly distributed broken wires in one wire rope lay for strand laid and single part slings, or five broken wires in one rope strand in one rope lay
- ✓ Severe localized abrasion or scraping is observed
- ✓ Kinks, crushing, birdcages, or any damage resulting in distortion of the rope structure is noted
- ✓ There is evidence of heat damage
- ✓ The end attachments are cracked, deformed, or worn to the extent that the strength of the sling is substantially affected
- ✓ There is severe corrosion of the wire rope or end attachments
- ✓ Missing or unreadable sling I.D. tags. (With Manufacturer's permission, the rated capacity can be stamped on the socket.)
- ✓ All wire rope slings will have tags and the rated capacity will be on the eye of the sling.

4.18 Chain Slings and Chain: Chain slings and chain used during a lift are a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.18.1 Check chain and attachments prior to each use. Conditions such as the

following are reasons for replacement:

- ✓ Wear, nicks, cracks, breaks, gouges, bends and weld spatter damage to the chain links,
- ✓ Elongation exceeding 15% of original dimensions,
- ✓ Discoloration from excessive temperature,
- ✓ Chain links and attachments that do not hinge freely to adjacent links,
- ✓ Missing or unreadable sling identification.

4.18.2 Grade 80 high strength alloy is the only chain to be used for lifting, hoisting, pulling or any other load bearing application. (Exception: if the chain is supplied and certified by a manufacturer as part of a manufactured device, i.e., a lifting sling, chain hoist, etc.).

4.18.3 Determine the safe working load for all lift chains by referring to the current manufacturer's specifications of working load strengths versus chain size. If the manufacturer's information is not available, follow the limits in the following table.

GRADE 80 ALLOY CHAIN

SIZE (inches)	MAXIMUM (lbs.)
9/32	3,500
3/8	7,100
1/2	2,000
5/8	18,100
3/4	28,300
7/8	34,200
1	47,700
1 1/4	72,300

Grade 70 chain will not be used for any applications

4.18.4 All lifting devices, such as hooks, links, pins, etc., must be made of alloy steel. Do not use lifting devices made of mild steel or rolled steel under any circumstances.

4.18.5 To avoid personal injury or chain damage:

- ✓ Keep chains free of twists, kinks, knots and make sure grab hooks fit the chain and are placed on the hitch so that no side strain occurs

during the lift.

- ✓ Do not impact load or jerk chain. Apply the load slowly.
- ✓ Protect the chain from sharp corners and objects. Protect the chain from corrosion and high temperature
- ✓ Do not use "patent links," "repair links," or "figure eight" links when repairing lifting chain.

4.18.6 Lubricate chains as required when operating them over sheaves or pulleys. Use an approved lubricant to ensure maximum chain life. Minimize excess dripping of lubricant.

4.19 Synthetic Slings: Synthetic slings used during lift are a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.19.1 Synthetic Sling Inspection: Inspect synthetic slings prior to each use. In addition, a periodic inspection must be performed by a person designated by the manager/supervisor and a record of the inspection maintained at the facility until a subsequent inspection is performed.

4.19.2 Synthetic Sling Replacement: Synthetic slings must be replaced if any of the following conditions exist:

- ✓ The sling has acid or caustic burns,
- ✓ Melting or charring of any part of the sling,
- ✓ Tears, cuts, or snags to the sling,
- ✓ Broken or worn stitching in the load bearing splices,
- ✓ Excessive abrasive wear,
- ✓ Knots in any part of the sling or if two or more slings are tied together,
- ✓ Permanently attached fittings are excessive pitted, corroded, cracked, distorted or broken,
- ✓ Other visible damage that causes doubt as to the strength of the sling,
- ✓ Missing or unreadable sling identification.

4.20 Webbing and Round Slings: Webbing and round slings used during a lift are a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.20.1 All the fibers in a webbing sling are load bearing. In a round sling, the load bearing fibers are "wound" within a protective jacket. The protective jackets are not load bearing and protect the load bearing fibers. Do not bunch or pinch the sling in a fitting.

4.20.2 The following conditions are reasons for replacement:

- ✓ Melting, charring, or weld splatter of any part of a round sling,
- ✓ Holes, tears, cuts, embedded particles, abrasive wear, or snags that expose the core fiber,
- ✓ Broken or worn stitching in the cover which exposes the core fibers,
- ✓ Missing or unreadable tags.

4.21 **Ropes**: Rope used during a lift is a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.21.1 Inspect all manila, hemp, or synthetic fiber ropes before they are used for lifting.

4.21.2 Remove any frayed, cut, or defective rope from service immediately. The capacity rating for the rope must not be exceeded.

4.22 **Fittings**: Fittings used during a lift are a critical part of the ability of the crane to safely handle the load. The following rules must be strictly complied with:

4.22.1 Fittings must be inspected:

- ✓ When purchased,
- ✓ Prior to each use.

4.22.2 Conditions for fitting replacement:

- ✓ Any significant permanent deformation, or change in shape, indicating the fitting has been overloaded,
- ✓ More than 10% wear of any sectional dimension as measured by comparing the fitting to a fitting with no wear, or a catalog dimension for the fitting,
- ✓ Any crack, sharp nick, or gouge in the surface of the fitting,
- ✓ Any modification to the fitting is cause to remove it from service. (Welding or heating, substitution of parts, and bending of the fitting are examples of modification.)
- ✓ More than one broken wire of the wire rope occurring within a length from the fitting equal to one wire rope diameter.

4.22.3 Eye Bolts and Hoist Rings:

The use of eye bolts at the load connection causes the horizontal sling angle to become smaller as the loads on each leg and each eye bolt increase. As the eyebolt becomes side loaded, the eyebolt loses strength.

The following requirements must be followed:

- ✓ Do not exceed the working load limits (normally stamped on the eye bolt),
- ✓ Do not use regular nut eye bolts for angular lifts,
- ✓ Use properly sized swivel hoist rings that match the sling loading requirements, or shoulder nut eye bolts for angular lifts,
- ✓ Always tighten nuts securely against the load,
- ✓ Always apply the load to the eye bolt in the plane of the eye,
- ✓ When using lifting slings of two or more legs make sure the lifting forces on each leg are calculated to ensure the capacity of the slings and fittings are not exceeded.

4.22.4 Hooks and Attachments: The following requirements must be followed:

- ✓ Non-alloyed carbon-steel hooks, repair links or other attachments must not be used,
- ✓ Homemade or makeshift bolts, rods, shackles, hooks or other attachments must not be used unless approved by the Engineering Department for the expressed purpose for which the device is to be used,
- ✓ Handles and other attachments must not be welded to hooks,
- ✓ Hooks must be replaced if they have a twist of 10 degrees or more or a 15% or greater increase in the throat opening,
- ✓ Hooks equipped with safety latches must have them in place prior to use,
- ✓ Dye penetrant or equivalent testing must be conducted on crane hooks annually. Hooks purchased after September 30, 1991 require a dated record of proof testing prior to use. The individual doing the test must be competent to perform the test and interpret the results. The test may be performed by an employee designated by the manager/supervisor to perform the test or by an outside contractor who is qualified to perform the test.

(TOC)

5.0. HAND TOOLS and PORTABLE POWER TOOLS

5.1. **HAND TOOLS**: Employees using hand tools must be trained in the purpose of the tool and must not use it for other purposes. Training in the use of the tool must include the proper handling of the tool and the limitations of the tool.

5.1.1. Hand tools must be kept in good working condition and used only for the purpose for which they were designed.

5.1.2. Employees must inspect tools before use. Tools having worn parts, mushroom heads, broken tips, split or defective handles, dull cutting surfaces, or other defects must not be used. Electric hand tools having an improper or missing grounding system or having split insulation must be removed from service.

5.1.3. Tools must not be left on scaffolds, ladders, or overhead working spaces. Containers must be provided to hold tools and prevent them from falling.

5.1.4. Sharp-edged or pointed tools must not be carried in employees' pockets with the cutting edge exposed.

5.1.5. Containers and hand lines must be used for transporting tools from one level to another; tools must be returned in the same manner and not transported up or down by hand, carried in pockets, or dropped.

5.1.6. Tools must not be thrown into boxes or truck beds, but must be carefully placed and secured.

5.1.7. Operators must wear appropriate personal protective equipment, as specified in the job hazard analysis, when using tools.

5.2. **POWER TOOLS**: Employees using power tools must be trained in the purpose of the tool and must not use it for other purposes. Supervisors must conduct training on the proper use, safe operation, and limitations of the tool. This may include the tool's safety features, required PPE, hazards, start-up procedures, safe operating procedures, correct feeding or loading procedures, shut-down procedures, and maintenance procedures/schedules. The EH&S Department is available to support this training effort.

5.2.1 GFCI pigtails must be used on all portable motorized equipment.

5.2.2 Extension cords must never be plugged into an outlet when not in use. If extension cords are run temporarily across walkways, a cord runner must be applied.

5.2.3 Cord Caps: The use of electrical cord caps does not meet CAP Electrical Safety requirements because they do not seal properly, pose a risk in wet

environments and often void the manufacturer's warranty. The correct manufacturer replacement cord should be installed by an electrician. If the proper replacement cord cannot be found for certain types of applications, the EH&S Department will assist in finding an appropriate replacement cord and/or cord cap on a case by case basis.

5.2.4 Portable power tools and equipment must not be operated without required safety guards. All belts, shafts, gears, and other moving parts on machinery must be fully enclosed and guarded.

5.2.5 Electric-powered shop and hand tools must be double insulated or effectively grounded. Refer to the Electrical Safety Section of the rulebook for ground fault circuit interrupter requirements.

5.2.6 Only qualified employees are allowed to operate power tools.

5.2.7 Air connections must be secured and must not be uncoupled without first closing the air valve and relieving the pressure, unless the equipment is equipped with a quick disconnect. Whip checks or hoses equipped with check valves on both ends must be used. Wire must not be used in air or hydraulic couplings in place of clip pins.

5.2.8 Do not lay down a pneumatic, electric or other power tool with the motor running. Power tools must be placed so they will not be started accidentally. When unattended, the power source must be disconnected. Do not lay power tools on wet surfaces or in loose soil.

5.2.9 Do not use hand sockets on impact wrenches. Nails, wire or cotter pins must not be used to hold sockets in place.

5.2.10 Huck guns and all hydraulic two-piece rivet guns must be held perpendicular to the surface to which the bolt is being applied. Hands and fingers must not be placed between the huck tools and/or parts being fastened as the tool tightens the collar.

5.2.11 Keep nail/staple guns pointed away from the body and other personnel. Ensure that no one is located behind the object being nailed or stapled into.

5.2.12 All chain saws should have a chain brake. Those saws not equipped with a chain brake must have a tip protector. Be alert to the conditions, which may adversely affect footing and safe operation of the saw. Avoid cutting directly overhead. Where there is a fire hazard, a fire extinguisher and shovel must be immediately available when using a chain saw.

5.2.13 Before operating grass weed or brush cutting devices make sure guards are in place.

5.2.14 Tools must not be thrown into boxes or truck beds, but must be carefully placed and secured.

5.2.15 Operators must wear appropriate personal protective equipment as specified in the job hazard analysis

5.2.16 Tools used in a potentially explosive atmosphere must be approved and listed by a recognized testing laboratory (e.g. Underwriters Laboratory, NSF, etc.) as Class I Division 1 approved.

5.3 POWDER-ACTUATED TOOLS

5.3.1 Only employees designated by their manager/supervisor are permitted to use powder-actuated tools (e.g. Hilti gun or Ramset gun). Employees must be trained in the operation of the particular tool in use and must follow manufacturer's instructions for its use.

5.3.2 The tool must be tested each day before loading to see that safety devices are in proper working condition. The method of testing must be in accordance with the manufacturer's recommended procedure.

5.3.3 Any tool found not in proper working order, or that develops a defect during use, must be immediately removed from service, tagged "out of service", and not be used until properly repaired.

5.3.4 Personal protective equipment in accordance with the manufacturer's instructions must be used.

5.3.5 Tools must not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any person. Hands must be kept clear of the open barrel end.

5.3.6 Loaded tools must not be left unattended.

(TOC)

6.0. COMPRESSED GAS CYLINDERS USE AND STORAGE

6.1. **General**: Compressed gas cylinders are found throughout the CAP. Their storage and use pose a serious potential hazard for all employees who may be in the vicinity of or who may handle gas cylinders.

Storage of Compressed Gas Cylinders: CAP personnel are required to follow CAP Policy titled, "Compressed Gas Procedures for Maintaining OSHA Compliance in CAP Facilities 2006."

6.2. **Manager's/Supervisor's Responsibility**: It is the responsibility of supervisory personnel where gas cylinders are used to see that the following safety rules are observed. They are also responsible to see that all employees under their supervision who use gas cylinders have been trained in the safe methods for storage, handling, and use of compressed gas cylinders.

6.3. Handling and Use of Compressed Gas Cylinders

6.3.1. All compressed gas cylinders (regardless of size) must be secured to racks, walls, work benches, or hand trucks by a strong chain or strap, or secured by any other approved method capable of preventing the cylinder from falling or being knocked over.

6.3.2. Oxygen/Acetylene welding carts must be equipped with fire resistant barriers. The removal of regulators and the capping of cylinders must occur if not used in 24 hours. When removing cylinders from a cart, ensure that the other cylinder is secure to prevent tipping and injury.

6.3.3. All questionable gas cylinders or equipment must be reported immediately to the supplier for correction or replacement.

6.3.4. All cylinders must be clearly labeled to identify the contents.

6.3.5. Only personnel trained in the proper transportation and safe use of gas cylinders should handle cylinders.

6.3.6. Compressed gases must be used only in areas with adequate ventilation for the gas being used.

6.3.7. Cylinders must not be intentionally dropped, struck, or permitted to violently strike each other and must be reasonably protected from violent impact of any kind.

6.3.8. All cylinders must be kept far enough away or shielded while in the work area in order to prevent contact with sparks, flame, or radiant heat.

6.3.9. Valve protection caps are required on all cylinders that are threaded to

accommodate a cap unless the cylinder valve is actually connected for use to a regulator or manifold.

6.3.10. All gas cylinders must be equipped with a functioning gas regulator while in use.

6.3.11. No one must attempt to connect a regulator and/or accessory equipment by the use of improvised hookups or adapters.

6.3.12. When personnel have finished using a compressed gas cylinder for the day, the cylinder valve must be closed and the pressure in the regulator and associated equipment released.

6.3.13. If a compressed gas is used to maintain a static pressure on a closed system, a clearly visible warning sign must be posted indicating the approximate pressure the system is under and the gas involved.

6.3.14. All empty cylinders must have their valves closed.

6.3.15. All empty cylinders must be handled with the same care as full cylinder.

6.3.16. Compressed air must not be used for cleaning purposes (to blow dust and debris away) without appropriate reduction valves (30 p.s.i. maximum).

6.3.17. Under no conditions must a person direct high pressure gas at himself or another person, regardless if a reduction valve is in use or not.

6.3.18. While in use, all cylinders of flammable gases must be protected by an approved flashback protection device.

6.3.19. Cylinders of flammable gas must not be opened more than 1-1/2 turns of the cylinder valve to allow for quick closing. If a special wrench is required, the wrench must be left in position on the stem of the valve while the cylinder is in use. This allows the gas flow to be shut off quickly in case of an emergency.

6.3.20. All oxygen cylinders and manifolds must be at least 20 feet away from or separated by a one half hour rated fire resistant partition from all flammable gases and materials (such as oil, grease, and all petroleum products in general) in the area of use.

6.3.21. All manifold enclosures for oxygen in excess of 2000 cubic feet of manifold capacity must be vented to the outside and the cylinder or manifold must be protected with check valves or alarms.

6.3.22. Due to the possibility of an explosion, all regulators and other equipment

used for oxygen must be identified as being "OXYGEN ONLY" and the equipment used for other gases must not be used for oxygen.

6.3.23. Due to the possibility of an explosion, all oxygen regulators, tubing, etc. must be kept clean and free of all organic materials such as oil and lint.

6.3.24. In the event a particularly hazardous gas (e.g., phosgene, hydrogen chloride, hydrogen cyanide) is used, a procedure must be established for evacuating, sealing, and isolating the area of use. The EH&S Department must be notified prior to procuring such hazardous gases.

6.3.25. Only personnel properly instructed in the chemical and biological hazards of a corrosive and/or toxic gas are to release or use the gas or operate any equipment using the particular gas.

6.3.26. The necessary first aid supplies must be available and personnel adequately trained in their use in case of the release of a hazardous gas being used. The EH&S Department must be advised of the use of any non-stock hazardous gas prior to its use.

6.3.27. All compressed gas cylinders must be sent in for hydrostatic testing every 5 years. (with the exception of acetylene)

6.4. **Transportation of Compressed Gas Cylinders**: When cylinders are moved, they must be disconnected from any regulators or manifolds, and where threaded to accept protective valve caps, the valve caps must be secured in place before the cylinders are released from their securing device.

6.4.1. Cylinders must be moved only on a hand truck or other cart designed for handling gas cylinders.

6.4.2. No more than one cylinder must be handled at a time except on carts designed to transport more than one cylinder.

6.4.3. Compressed Gas Cylinders must be secured during transportation and storage. Anything over 100 lbs. in transport must be labeled and placarded according to DOT requirements.

6.5. **Storage of Compressed Gas Cylinders**: Compressed gas cylinder storage areas must be located away from emergency exits and must be kept well drained, well ventilated, cool, and protected from the weather. Regardless of size, all cylinders must be provided with supports (straps, chains, or other similar devices) capable of preventing the cylinders from falling.

6.5.1. Under no condition must the temperature of gas cylinders exceed 125°F. When Type E gas cylinders are being used the temperature must not exceed 93°F since the relief valves of Type E cylinders are set to release above 93°F.

6.5.2. Excessive storage time must be prevented by the use of the smallest practical size cylinder for a particular gas application. The vendor should be consulted if there is a question as to the appropriate length of time a cylinder of gas should be stored.

6.5.3. Corrosive gases must not be stored for more than six (6) months. Usually after this period of time there is a deterioration of the gas purity, which increases the possibility of cylinder valve malfunction.

6.5.4. Oxygen must not be stored in the same area with flammable gases unless separated by at least 20 feet or by a fire resistant barrier having a one-half hour rating. Cylinders stored in an area outside a building must be a minimum distance of 20 feet from flammable gases or combustible material.

6.5.5. All storage rooms that contain in excess of 2000 cubic feet of oxygen and/or nitrous oxide must be vented to the outside.

6.6. **Fire Extinguisher Cylinders**: High pressure cylinders used in fire extinguishing systems must not be recharged without a hydrostatic test (and re-marking) if more than 6-years have elapsed from the date of the last test.

Cylinders continuously in service without discharging are permitted to be retained in service for a maximum of 12 years from the date of the last hydrostatic test. At the end of 12 years, compressed gas cylinders must be discharged and retested before being returned to service. (Reference NFPA 12, 1-9.5.1)

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7.0 WELDING, CUTTING and HEATING

7.1. General: These rules are applicable to all welding, cutting, and heating work procedures and it is the responsibility of the Supervisor and the employee performing the work to comply.

7.2. Usage: Only employees authorized by their manager or supervisor are permitted to use welding, cutting and brazing equipment. Employees performing welding, cutting, and heating must be trained prior to performing these activities.

7.3 Respiratory Protection: Due to the low exposure limits, CAP's EH&S Department requires employees to wear respiratory protection whenever welding is conducted on stainless steel.

7.4 Eye Precautions: All persons performing or observing cutting, welding or heating operations must wear proper eye protection and other personal protective equipment. They must not look at electric arc or oxy/fuel flame unless properly protected and must warn others against looking at the arc or flame.

7.5. Minimum Shade Requirements: The following chart defines minimum shade requirements during cutting and welding.

Welding Operation	**Shade No.**
Shielded Metal arc Welding- Electrodes up to and including 5/32 inch diameter	10
Gas-Tungsten Arc Welding (non-ferrous) and Gas shielded Arc Welding (non-ferrous) – Electrodes up to and including 5/32 inch diameter	11
Gas Tungsten Arc Welding (ferrous) and Gas shielded Arc Welding (ferrous) – Electrodes up to and including 5/32 inch diameter	12
Shielded Metal Arc Welding Electrodes: 3/16 through 1/4 inch diameter 5/16 through 3/8 inch diameter	 12 14
Carbon Arc Gouging – Most applications - Large diameter electrodes	12 14
Soldering	2
Torch Brazing	5
Light cutting up to 1 inch	4
Medium cutting, 1 inch to 6 inches	5

Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/9 inch	5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1/2 inch and over	6 or 8

7.6 **Shields**: Welders must shield the welding arc from the view of others whenever possible or must warn others of the hazard prior to starting welding. Use shields or other protective devices to prevent setting fire to or damaging structures or other material.

7.7 **Welding Clothing**: When cutting, heating or welding wear high top boots, leather welding gloves or leather welding mittens and flame resistant clothing. When performing arc or oxy/fuel operations wear at minimum, an approved full welding jacket. Flame resistant clothing should protect the skin from infrared and ultraviolet radiation.

Protective outerwear such as leather aprons, leather jackets, spats or sleeves must be worn for overhead welding or an application where the body is in danger of being exposed to sparks or slag. All buttons on jackets must be buttoned. Sleeves and pockets must be secured against hot slag. Clothing must be free of oil or grease and trousers or coveralls must be without cuffs. Do not carry cigarette lighters or matches where they may be exposed to excess heat.

7.8 **Brushing Slag**: Do not use your hands, whether gloved or not, to brush slag or metal from material being welded or cut.

7.9 **Defective Welding Equipment**: Do not make repairs or alterations to cylinders, valves, or torches. Defective cutting and welding equipment must be repaired or replaced.

7.10 **Fire Extinguisher**: Fire extinguishers, or other suitable fire extinguishing equipment must be on hand during welding, cutting and other open flame torch operations.

7.11 **Fire Watch**: Before leaving the work site, the person in charge must check to see that no fire or fire hazard exists. If a potential fire hazard exists, the worker in charge must assign a watchman equipped with a fire extinguisher or ample water supply to stay in the area for a minimum of 30 minutes after the last weld is completed.

7.12 **Confined Space Welding**: Welding in confined spaces must be conducted in accordance with CAP's Confined Space Program.

7.12.1 **Welding Ventilation**: Welding and cutting in confined spaces must be conducted with mechanical or local exhaust ventilation during the welding operation.

7.12.2 Gas Cylinders in Confined Spaces: Employees must not place gas cylinders inside the confined space.

7.12.3 Equipment in Confined Spaces: All welding and cutting equipment must be removed from the confined space when not in use.

7.13 Welding on Drums, Barrels and Tanks: Do not weld or cut on containers such as drums, barrels, or tanks until the following conditions have been met:

7.13.1 Determine what the container last held. Thoroughly wash out and steam out any container that held volatile or flammable materials.

7.13.2 After cleaning, remove plugs or caps and further safeguard the container by filling it with water (if chemical readily dissolves in water) or inert gas before cutting, welding, soldering, or open flame work. Ensure that the container has a vent or opening to allow hot gas to escape.

7.14 Cleaning with Oxygen: Oxygen must not be used for compressed air as a source of pressure or to "dust" clothing.

7.15 Oil/ Grease Contact with Oxygen: Do not allow oil and grease to come in contact with oxygen. Keep welding equipment, gloves, hands and clothing free of oil and grease. Do not allow oil and grease to touch regulators, valves or connections.

7.16 Ventilation: Welding must be done in well-ventilated areas.

7.17 Sparks, Hot Slag and Open Flames: Do not allow cylinders to be exposed to sparks, hot slag, open flame and other sources of excessive heat.

7.18 Welding Work Surface: Do not lay an object to be heated, cut or welded across a cylinder or on concrete.

7.19 Cutting Steel Sections: When cutting damaged steel sections, take precautions to prevent personnel from being struck by severed sections.

7.20 Cutting and Torch Work: The following precautions for cutting and torch work are specific to that type of work activity and must be complied with:

7.20.1 Select the proper welding head or mixer and tip or cutting nozzle (according to charts supplied by the manufacturer), and screw it firmly into the torch.

7.20.2 Before changing torches shut off the gas at the pressure-reducing regulators and not by crimping the hose.

7.20.3 To discontinue welding or cutting for a few minutes, closing only the torch valve is permissible. If the welding or cutting is to be stopped for a longer period (e.g. during lunch or overnight) proceed as follows:

1. Close oxygen and acetylene cylinder valves.

2. Open torch valves to relieve all gas pressure from hose and regulator.

3. Close torch valves and release regulator pressure- adjusting screws.

7.20.4 Do not use matches to light torches. Use a friction lighter, stationary pilot flame, or other suitable source of ignition. When lighting, point the tip so that no one will be burned when the gas ignites.

7.20.5 Never put down a torch until the gases have been completely shut off. Do not hang torches from a regulator or other equipment so that they come in contact with the sides of gas cylinders. If the flame has not been completely extinguished or if a leaking torch ignites, it might heat the cylinder or burn a hole into it.

7.20.6 When extinguishing the flame, close the acetylene and oxygen valves in the order recommended by the torch manufacturer. If oxygen is closed first, carbon soot will be deposited in the air. However, this ensures that the acetylene valve is closed tight when the flame is extinguished. If the acetylene valve is turned off first, no soot is formed, but there is no assurance that the fuel gas valve is closed and that it is not leaking.

7.21 Hoses and Hose Connections: The following rules and instructions pertain to the hoses used for welding and cutting operations and must be followed:

7.21.1 Do not use an unnecessarily long hose, it takes too long to purge. When a long hose must be used, see that it does not become kinked or tangles and that it is protected from being run over by trucks or otherwise damaged. When a long hose must be used in areas exposed to traffic (pedestrian or vehicle) suspend it high enough overhead to permit unobstructed passage.

7.21.2 Repair leaks at once. Repair hoses by cutting the hose and inserting a splice. Don't repair a leaky hose by taping.

7.21.3 Examine hoses and connections frequently for leaks and worn places. Test for leaks by immersing the hose in water under normal working pressure.

7.21.4 Protect hoses from flying sparks, hot slag, other hot objects, and grease and oil. Store hoses in cool place.

7.21.5 A single hose having more than one gas passage must not be used. When oxygen and acetylene hoses are taped together to prevent tangling, not more than 4 in. of each 12 in. of hose must be taped.

7.21.6 The use of hoses with an external metallic covering is not recommended. In some machine process and in certain types of operations, hoses with an inner metallic reinforcement that is exposed to neither gas passage nor outside atmosphere are acceptable.

7.21.7 Flashback arrestor devices are required between the torch and hose and between the hoses and regulator. Torches in which the manufacturer has built a flashback arrestor inside the torch are considered in compliance.

7.21.8 Hoses that show signs of severe wear must be replaced or tested at twice-normal pressure or at least 300 psi and discarded if found leaking.

7.21.9 Hoses for gases must be different colors or otherwise distinguished from each other. The following colors should be used:

- ✓ Red for fuel gases,
- ✓ Green for oxygen, and
- ✓ Black for inert gases and air hoses.

7.22 Regulators/Hoses: The following rules are applicable to the regulators and hoses used in welding operations that use pressurized gases and must be complied with to insure a safe operation:

7.22.1 Pressure regulators must be used on all oxygen and fuel gas cylinders

7.22.2 Oxygen regulators must be equipped with a safety relief device or designed to prevent broken parts from being projected in the event of diaphragm rupture.

7.22.3 Workers must stand to one side and away from regulator gauge faces when opening cylinder valves.

7.22.4 Only regulators listed by OSHA approved testing laboratory such as Underwriters Laboratories Inc. or Factory Mutual will be used with compressed gas. Each regulator must have a high-pressure and low-pressure gauge.

7.22.5 High-pressure oxygen dial gauges must have safety vent covers to prevent parts from flying in case of internal explosion.

7.22.6 Regulators must be handled with extreme care. Damaged regulators must be sent back to the manufacturer for repair.

7.22.7 Leaky or creeping regulators must be withdrawn from service at once for repairs.

7.22.8 If the regulator pressure gauge does not read correctly, it must be withdrawn from service and repaired.

7.22.9 The following procedures must be followed when regulators or reducing valves are attached to a gas cylinder:

1. To blow dust or dirt out; crack the discharge valve of the cylinder by opening it slightly for an instant and then closing it. (Check on fuel gas cylinders that no source of ignition is nearby).

2. Connect the regulator to the outlet valve on the cylinder. Be sure the regulator inlet threads match the cylinder valve outlet threads. Never connect oxygen regulator to a fuel-gas cylinder or vice versa. Do not force connections that do not fit easily. Be sure that connections between the regulators and cylinder are gas tight.

3. Release the pressure-adjusting screw on the regulator to its limit – turn it counter clockwise until it is loose. Engage the adjusting screw and open the downstream line to the air to drain regulator gas.

4. Open the cylinder valve slowly to let the hand on the high- pressure gauge move up slowly. On an oxygen cylinder, gradually open the cylinder valve to its full limit. On an acetylene cylinder, make no more than 1 ½ turns of valve spindle.

5. Attach oxygen hose to outlet of oxygen regulator and to oxygen inlet valve on torch.

6. Test oxygen connection for leaks. Be sure the torch valve is closed; then turn oxygen regulator pressure adjusting screw clockwise to give about normal working pressure. Using soapy water or approved leak test solution check the connections for leaks. At the same time, check regulator for creeping, indicated by an increase in the reading on the low- pressure (delivery) gauge.

7. Attach and check acetylene hose for leaks as outlined in step 6 above, except that pressure should be set to no more than 10 psig.

8. If torch is to be used immediately, proceed to step 9. If not, close cylinder valves, open torch valves to relieve pressure, close torch valves and release the pressure adjusting screw on regulators.

9. To adjust pressures of oxygen and fuel gas prior to using torch, proceed as follows: with all torch valves closed, slowly open oxygen cylinder valve, open torch oxygen valve and turn pressure adjusting

screw on oxygen valve on regulator to desired pressure, then close torch valve. Open acetylene cylinder valve (1 ½ turns maximum), and with torch acetylene valve closed, turn pressure-adjusting screw to desired pressure.

10. Purge each line individually. Open oxygen torch valve and release oxygen to the atmosphere for a few seconds before closing valve; then open acetylene torch valve and release acetylene to atmosphere for a few seconds before closing valve.

11. Open torch acetylene valve, light flame, and readjust regulator. Then close torch acetylene valve.

12. Open torch valves and light torch according to procedure described in instructions provided with the equipment. The procedure for operating one torch may not be satisfactory for another.

7.23 Electrical Arc Welding: The following rules apply to the use of electrical arc welding equipment and their operation and must be complied with to insure a safe operation:

7.23.1 Alterations, modifications, and repairs to welding equipment must be done in a manner that prevents electrical hazards. Manufacturer's instructions must be followed.

7.23.2 All exposed conductive parts of arc welding equipment should be properly grounded. Prior to welding the employee must inspect the welding lead sand welder for visible damage. Welding equipment with visible damage must not be used.

7.23.3 The primary welding (input) terminals should be properly insulated and protected to prevent electrical hazards.

7.23.4 The secondary welder (output) terminals should be shrouded with insulating sleeves of sound construction and design.

7.23.5 Maintenance that includes insulation testing for the arc welding and cutting equipment should be performed on a regular basis. Only a qualified mechanic or electrician may make repairs to welding equipment

7.23.6 A proper welding return should be provided and its cross-section should not be less than that of the welding lead. The return lead should be securely bonded to the work piece

7.23.7 Bare conductors should not be used as welding leads or welding returns.

7.23.8 The work piece should be effectively grounded and the conductor forming the earth for the work piece should be of sufficient low

impedance. It should also be protected from mechanical damage and inadvertent disconnection and be as close as possible to the work piece.

7.23.9 All cable connections should be clean and tight. Cable connectors should be used.

7.23.10 All cables should be of the correct type and current- carrying capacity. They should be routinely examined for defective insulation prior to use.

7.23.11 Trailing welding cables should be kept clear of walkways and be protected against mechanical damage using coverings or by securing to overhead fixture. They should be properly laid to prevent tripping hazards.

7.23.12 A fully insulated electrode holder of correct rating should always be used.

7.23.13 When not in use, the holder should not be placed on metal objects, but should be hung up so that it is clear of any nearby metal objects, or placed on a wooden or non- conducting surface.

7.23.14 The welding cable should be properly connected to the holder.

7.23.15 The electrode holder should be properly maintained to prevent damage to the insulating material.

7.23.16 Cables must be in continuous lengths without splices or taps.

7.23.17 Do not allow cables to contact or be pulled through pools of water. Do not allow electrode to contact water.

7.23.18 Power supply cables, to portable welding machines, must include a conductor for grounding protection. One end of this conductor must be connected to the machine frame. The supply end must be connected to a suitable grounding connection.

7.23.19 Insulating gloves should be worn when an electrode is inserted into or removed from a holder.

7.23.20 Welders should avoid allowing any part of their body to complete an electric circuit; this includes touching any electrically live parts with wet or damaged clothing, gloves or boots.

7.23.21 The welding equipment should not be left unattended with the current switched on.

7.23.22 When welding is finished, the electrode should be removed from the holder and the power supply should be switched off.

7.23.23 When welding is performed in a damp place, an insulated mat should be used, or rubber boots should be worn.

7.23.24 The appropriate welding current should be chosen for the correct type of welding electrode. The supplier's instructions should be followed in making the choice.

7.23.25 Electric arc welding generates very strong UV light. The welding operation must be properly enclosed by appropriate screening to protect people in the vicinity from being harmed by the strong UV light emission.

7.23.26 When welding above floor level, provision for protection from a fall should be made in case of electrical shock.

7.23.27 Welders must not loop or coil the electrode around their body.

7.23.28 Protect welding equipment from moisture. Welding machines that have become wet must be dried and tested prior to reuse.

7.23.29 Do not change the polarity when the welding machine is operating under welding current load.

(TOC)

8.0 LADDERS

8.1. **General**: Ladders are very common and convenient pieces of equipment for reaching heights. However, serious accidents may result when ladders are used improperly. All ladders including stepladders must be constructed per applicable ANSI requirements. The following are essential safety guidelines that are to be followed when using ladders:

8.2. **Wooden Ladders**: Wooden ladders must not be used. (Note: exception is made to this rule to allow for the use of those ladders commonly referred to as "chicken ladders" to access the canal slope during repairs to the concrete panels.)

8.3. **Metal Ladders**: Metal ladders must be constructed per applicable ANSI requirements and commercially manufactured if possible. Special attention to the following is required.

8.3.1. Uprights and rungs should have a cross-section adequate to prevent dangerous deflection.

8.3.2. The intervals between rungs should be12 inches.

8.3.3. The rungs of metal ladders should be corrugated or treated to prevent slipping.

8.4. **Fiberglass Ladders**: Fiberglass ladders must be constructed per applicable ANSI requirements and commercially manufactured.

8.5. **Non-slip Foot Wear**: If necessary to prevent slipping, ladder users should wear non-slip shoes.

8.6. **Single Ladder Length**: The length of single ladders or individual sections of ladders must not exceed 30 feet.

8.7. **Two Section Ladder Lengths**: Two section ladders must not exceed 48 feet in length and ladders with more than two sections must not exceed 60 feet in length.

8.8. **Stepladder Length**: Stepladders must not exceed 20 feet in length.

8.9. **Chain or Rope Ladders**: The use of chain or rope ladders is restricted to those uses that are specifically approved by both the Department Manager and the EH&S Manager.

8.10. **Ladder Use**: Careful consideration as to the type of ladder and its intended use is critical to the safety of the work. The following rules apply when using ladders.

8.10.1. The ladder being used should be of a type suitable for the purpose and

capable of supporting the weight to be supported.

8.10.2. Prior to use, ladders should be visually inspected for splits, cracks, missing parts and other defects.

8.10.3. Defective ladders must not be used.

8.10.4. The rails should be set on a firm base with both rails securely supported. A ladder should not be placed against a window frame.

8.10.5. The ladder should rest on a firm base. Bricks, boxes or other loose objects must not be used to level up rails or to gain additional height for ladders.

8.10.6. Adequate means should be provided to prevent the tipping of a ladder set up in a public thoroughfare or in any other place where persons, vehicles, etc. may accidentally collide with it.

8.10.7. A ladder should not be placed in front of a door, especially one that opens towards it, unless the door is fastened open, locked or guarded.

8.10.8. Ladders should be secured at the top-using lashing to rails, and/or at ground level using suitable stakes lashed to rails.

8.10.9. An attendant should be stationed at the base of the ladder in locations where movement is frequent or when securing of top or bottom is not possible.

8.10.10. A ladder should be set at an angle of approximately 75 degrees (1 out to 4 up) to avoid slipping or tipping backward.

8.10.11. When portable ladders are used for access to an upper landing surface, the ladder side rails must extend at least 3-feet above the upper landing surface to which the ladder is used to gain access; or when such an extension is not possible because of the ladder's length, then the ladder must be secured at its top to a rigid support that will not deflect, and a grasping device, such as a grab rail, must be provided to assist employees in mounting and dismounting the ladder. In no case must the extension be such that ladder deflection under a load would, by itself, cause the ladder to slip off its support.

8.10.12. The working position on a ladder should always be no less than 3 feet from the top of the ladder. This portion of the ladder is meant for use as a handhold.

8.10.13. When working on a ladder, the thighs of the person must be kept between the rails. Over-reaching from a ladder is very dangerous and must be avoided.

8.10.14. Only one person is allowed on a ladder at any one time.

8.10.15. Always face the ladder when climbing or descending.

8.10.16. When climbing or descending a ladder, the hands of the person should be free of any tools or objects. If objects have to be carried on ladders, suitable means such as tool bags carried with a shoulder strap or waist belt should be used for the purpose.

8.10.17. The rungs of a ladder should be free from grease and mud to prevent slippage. For the same reason, the shoes of a person should be cleaned of any grease or mud before climbing up the ladder.

8.10.18. When using trestle ladders, ensure that the spread between the front and back legs are restrained by effective means in such a way that the trestles are manner. As with straight ladders, the highest working position should be at least 3 rungs below the top of the ladder.

8.10.19. Metal ladders must never be used in the vicinity of exposed live electrical equipment.

8.10.20. A sufficient number of persons should be assigned in erecting or moving ladders, particularly long or heavy ladders.

8.10.21. Ladders should never be left unattended when in use. Ladders should be securely stored when not in use to prevent unauthorized use and to eliminate being blown over or struck. Ladders must be barricaded if personnel walk away for a moment.

8.10.22. Ladders must not be tied together to provide longer sections.

8.10.23. Neither the ladder standard (29 CFR 1926, subpart X) nor the fall protection standard (29 CFR 1926, subpart M) requires fall protection for workers while working on portable ladders of any height, or on fixed ladders that are less than 24' in height. Existing fixed ladders 24' or greater in height shall have fall protection in the form of a cage, well, ladder safety system or personal fall arrest system.

Note: Effective November 18, 2018, all newly installed fixed ladders 24' or greater in height must have a ladder safety system or personal fall arrest system. Effective November 18, 2036, all existing fixed ladders 24' or greater in height must be retrofitted with a ladder safety system or a personal fall arrest system.

8.11. Inspection, Maintenance and Storage: The following rules are applicable to the care of ladders and must be complied with at all times.

8.11.1. Ladders must be inspected at least quarterly and a record of the inspection and any necessary repairs should be maintained at the facility. At a minimum check for:

- Loose steps or rungs
- Loose nails, screws, bolts or other metal parts
- Cracked, split, or broken uprights, braces or rungs
- Slivers on uprights, rungs or steps
- Damaged or worn non-slip bases Step Ladders
- Wobbly (from side strain)
- Loose or bent hinge spreaders
- Loose hinges
- Broken, split, or worn steps Extension Ladders
- Loose, broken, or missing extension locks
- Defective locks that do not seat properly while extended
- Worn or rotted rope

8.11.2. Ladders that are involved with an accident or near miss must be immediately inspected for damage.

8.11.3. Defective ladders should be clearly labeled "OUT OF SERVICE" pending repair and must not be stored with ladders in good condition. Defective ladders that cannot be satisfactorily repaired should be destroyed.

8.11.4. Wooden ladders should never be coated with paints or other products that could hide defects.

8.11.5. Ladders should be properly stored in dry and well- ventilated areas. Ladders should be stored in a horizontal position properly supported clear of the ground. For long ladders over 20 feet, at least 3 points of support should be provided. Ladders that are stored in an upright position should be secured to prevent falling if struck.

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9.0 HOUSEKEEPING and WORK AREA CONTROL

9.1. **General**: Good housekeeping is the best method of controlling the risks of injury and fire within a facility. Operating experience clearly indicates a significant increase in mishaps related directly to poor housekeeping practices. It is well established that good housekeeping significantly enhances the quality and quantity of work. Employees must expend the necessary effort to achieve and maintain a neat and orderly work environment.

9.2. **Storage Space**: Storage space must be physically adequate for the volume of materials being stored. If storage space is inadequate proper alternatives should be addressed (example: disposal of non- usable, obsolete items).

9.3. **Stored Materials**: Stored materials must be in a stable configuration in order to permit safe access, avoid clutter, and minimize the hazard of falling materials. Store materials out of aisles and out of doorways. Bags, containers, bundles, etc. stored in tiers must be stacked, blocked, interlocked and limited in height so that they are stable and secure against sliding or collapse.

Storage areas must be free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage.

9.4. **Racks, Shelves, and Cabinets**: Storage of materials on racks, shelves, and in cabinets must be in a stable manner. Storage on top shelving should be avoided, unless the shelving has a toe board (3 1/2 " nominal) to prevent material from rolling off.

9.5. **Compatibility of Stored Materials**: Materials stored together must be compatible. Dissimilar materials must not contribute to, or cause ignition of, other materials, nor enhance their rate of combustion once ignited. Safety Data Sheets and manufacturer's information must be consulted to ensure compliance.

9.6 **Self-dumping hoppers:** Use of self-dumping hoppers for the recycling of metal is required. Do not overfill or allow metal to protrude from the top of the hopper. Cut material so that it can safely be stacked.

9.7 **Working and Walking Surfaces**: Working and walking surfaces should be dry, smooth, and free of general clutter and provide good traction for walking.

9.8 **Storage of Equipment and Tools**: Equipment and tools, especially those with sharp surfaces, must be kept in their designated storage location when not being used.

9.9 **Storage of Flammables and Combustibles**: Flammables and combustibles must be in the proper storage cabinet and/or stored in compliance with the applicable OSHA and NFPA codes as required by the type and quantity of product.

Fire rated doors, including the door to pumping plant oil rooms and emergency fire exits, must be closed at all times, with the exception of temporary work tasks.

9.10 **Safety Lanes**: Safety lanes and safe-access lanes are typically floor markings that identify safe passage through or out of shops, warehouses, and similar locations. They also identify access lanes to control panels and emergency equipment, which must be kept clear and unobstructed. They must be clearly marked with either clear yellow or yellow- and-black striped lines, or by plastic tape affixed to the floor.

9.11 **Minimum clearances:** Minimum clearances for walkways and safety lanes are:

Walkways	44 inches
Driveways (i.e. forklift traffic)	10 feet or at least 1.5 times width of forklift
Emergency devices (i.e. fire extinguishers & alarms)	36 inches
Dead Front Electrical Cabinets and Panels	36 inches (<600 volts)

9.11.1 Barricades are used to identify and deny access to hazardous areas. The following precautions are to be taken:

9.11.2 Excavations, breaks in roads or floors, and similar conditions must be barricaded to prevent injury and damage to equipment and vehicles.

9.11.3 Posting and barricading of outside locations should be established in such a manner to adequately notify personnel, both during daytime and nighttime, of work locations and hazards. Materials used to protect these locations must be capable of withstanding the effects of weather.

9.11.4 Barricades must be provided with appropriate flashing lights at night hours and periods of reduced visibility.

9.11.5 Barricades must be placed far enough in advance of the actual working area to prevent traffic congestion.

9.11.6 Adequate signs (such as "Road Closed," "Aisle Blocked," "Detour," etc.) must be used in conjunction with barricades.

9.11.7 Breakaway links must be used in all chains that barricade an area in order to permit ready access by fire- fighting equipment. Such chains must be identified by the "international orange" color.

9.11.8 Work performed at heights can jeopardize persons at floor level as a result of falling objects. Such floor-level areas must be barricaded. Areas where ladders, scaffolding, or staging are being used must also be barricaded as a protection against falling objects.

9.11.9 Adequate warning signs and barricades must be provided for work areas where the use of lasers can pose serious eye injury from viewing a direct laser beam or reflection.

9.12 General Labeling and Posting Barricades Postings are used to identify safety hazards and provide instructions. The letter, color, format, and word requirements of ANSI Z535.2- 1991 will be used to convey safety-related information on signs. All employees must comply with posted warnings and instructions. In general, the following color codes are used:

9.12.1 Red Sign - With white and black, communicates a DANGER statement where an imminent hazard would cause serious personal injury or death.

9.12.2 Orange Sign - With black, communicates a WARNING statement where a potentially hazardous situation could result in serious injury or death.

9.12.3 Yellow sign - With black, communicates a CAUTION statement where a hazard could cause minor or moderate personal injury, or alert against an unsafe practice.

9.12.4 Blue Sign - With white, communicates a NOTICE statement pertaining to a company safety policy.

9.12.5 Green Sign - With white, communicates a general safety message.

9.12.6 Signs restricting access for safety reasons must be obeyed. Instructions such as "Do Not Enter" or "Authorized Personnel Only" must be observed.

9.12.7 Black and yellow “No Storage” tape must be used to prevent storage within 36 inches of electrical equipment, fire extinguishers, and eye wash stations. This tape should also be used to designate emergency egress routes.

9.12.8 Black and white "Storage" tape must be used to indicate a storage or staging area.

9.13 Barrier Tape: The use of barrier tape in establishing a barricade is acceptable and the following types are available for use as indicated.

9.13.1 DANGER TAPE – Red barrier tape with the word(s) “DANGER” OR

"DANGER DO NOT ENTER" should be used to communicate a DANGER statement where an imminent hazard would cause serious personal injury or death.

9.13.2 CAUTION TAPE - Yellow Barrier tape with the word(s) "CAUTION" or "CAUTION DO NOT ENTER". To be used to communicate a CAUTION statement where a hazard could cause minor or moderate personal injury, or alert against an unsafe practice.

9.13.3 Posting and barricading of outside locations should be established in such a manner to adequately notify personnel of work locations and hazards. Materials used to protect these locations must be capable of withstanding the effects of weather.

9.13.4 Unattended barricades should be posted indicating the applicable hazard and the contact person if entry is required.

9.13.5 Authorization for entry to such posted areas must be received from the responsible Manager. A written access authorization listing is suggested for areas containing ill-defined or intermittent personal hazards. Contact the EH&S Office for assistance with hazard posting.

9.14 Pipe Labeling: Because of the potential hazards associated with pipe transfer systems, piping must be labeled accurately as to the contents and intended direction of flow. Examples of hazards include:

Chemical reactivity (e.g., chlorine gas)
Chemical toxicity (e.g., acids)
Pressurization hazards (e.g., air, other compressed gas)
Thermal hazards (e.g., steam, hot fluids, and cryogenic materials)

9.15 Floor Loading: The approved floor loading for balconies, decks, and overhead walkways must be permanently posted in a conspicuous location. These signs must not be removed, obscured, altered, or modified by anyone without authorization of the Engineering Department.

9.16 Electrical Signage: Electrical circuit panel and breaker boxes should be marked so as to be easily identified and must have a minimum of three (3) feet clearance to the front so as to allow for inspection, maintenance, and servicing.

9.17 Markings must be as follows:

9.17.1 Electrical panels and boxes, 600 volts or more must be marked on the cover of the box with the appropriate voltage.

9.17.2 Each disconnecting means for motors, appliances, and equipment must be legibly marked so as to indicate its purpose.

9.17.3 Each service, feeder, and branch circuit must be legibly marked as to its purpose at its disconnecting means or over- current device.

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10.0 ELEVATED WORK LOCATIONS and FALL PROTECTION

10.1. General: It is CAP's policy to ensure that the equipment and structural provisions for accessing and working at elevated levels and for overhead movement of materials meet the best industry safety standards.

10.2. Fall Protection: Protection from falls must be provided in all circumstances required by OSHA and/or CAP Safety Rules. Whenever employees are exposed to a fall hazard of four feet or more (six feet in construction work), a form of fall protection must be provided and used. This protection may be provided by the use of a Personal Fall Arrest System (PFAS), guardrails, or other approved method of protection.

A PFAS includes the use of a harness, connector, and anchor point. A properly installed and used PFAS – including anchor points – will be rated at a minimum of 5,000 pounds, or when designed and approved by a qualified person, twice the expected load. A Fall Restraint System is also an acceptable form of fall protection. When used properly, a restraint system will permit an employee to access the required work area but will prevent the employee from actually falling. (Reference CAP Fall Protection Program)

10.2.1. Every floor, wall and yard opening must be guarded to prevent employees from falling through or into the opening.

10.2.2. Elevated platforms, runways and walkways must have railings or handrails. Where there is exposure below from falling materials, a toe board or equivalent must be installed.

10.2.3. Personal Fall Arrest Systems must be used where:

1. The employee is exposed to a fall greater than four feet. (<u>6ft. for construction</u>)

Exception: All portable ladders.

2. The employee is not protected by standard railing or other fall protection system (e.g. safety cages on ladders; fall restraint system).

10.2.4. All PFAS be installed to prevent free falls of greater than six feet.

10.2.5. Employees must inspect all components of a Personal Fall Arrest System prior to use.

10.2.6. Employees must install Personal Fall Arrest Systems in a manner that prevents the person from contacting any lower level or swinging into walls and other obstacles during the course of a fall.

10.2.7. Supervisors must ensure emergency procedures are in effect for the prompt rescue of personnel using a personal fall arrest system. Serious injury, including death, can occur in a very short period of time to an employee suspended in a harness.

10.3. Elevating Work Platforms: Elevating work platforms can be vertically adjusted by manual or powered means and may be self-propelled, towed, or manually moved. These include such equipment as scissor lifts, E-Z lifts, and others. Elevating work platforms are operated only under the following conditions:

10.3.1. Employees using any elevating work platform must be trained in the proper and safe use of the equipment. A trained operator must be stationed on the ground to operate the lower level controls of the work platform if necessary to lower the work platform. (This individual may perform other work activities but must be able to make visual observations of the elevated work platform when it is occupied).

10.3.2. Unless recommended for such use by the manufacturer, no elevating work platform is to be used on an inclined surface. No elevating work platform may be used on an incline over 5% or in winds that exceed 25 mph.

10.3.3. When directed by the manufacturer, all personnel on the mobile work platform must be provided and wear an approved safety harness and lanyard properly attached to the equipment.

10.3.4. All powered elevating work platforms must have working upper and lower control devices.

10.3.5. Outriggers, if provided, must be used as recommended by the manufacturer.

10.3.6. Wheel chocks must be used when the work platform is elevated with the vehicle on an incline.

10.3.7. Travel of units while employees, materials, tools, or equipment occupy the platform in an elevated position is not permitted unless allowed by the manufacturer's operating instructions.

10.3.8. All elevating work platforms must be inspected prior to each shift's use and if found unsafe must be tagged out of service and not operated. The operator must sign and date the logbook and note any discrepancies. "Before use" inspections must be conducted according to the manufacturer's Operation and Maintenance Manual.

10.3.9. All units must receive preventive maintenance at intervals no longer than recommended in the manufacturer's manual.

10.3.10. Copies of all inspections, preventive maintenance, and work reports must be retained for 2 years following a subsequent inspection or maintenance activity.

10.4. Extension Boom Aerial Lifts: An extension boom aerial lift has a telescoping or extensible boom with a personnel platform attached. Examples include the JLG, bucket truck, and similar units. Extension boom aerial lifts must be operated under the following conditions:

10.4.1. Employees using any aerial lift must be trained in the proper and safe use of the equipment. One trained operator must be present on the aerial boom or bucket and another trained operator must be stationed on the ground to operate the lower level controls of the aerial boom if necessary to lower the work platform or bucket. (This individual may perform other work activities but must be able to make visual observations of the elevated work platform when it is occupied).

10.4.2. All units must be inspected prior to each shift's use and must not be operated if found to be unsafe.

10.4.3. All personnel occupying the aerial lift must wear a body harness equipped with a side D-Ring along with a 3 foot straight lanyard (not a shock absorbing or deceleration device) attached to the lift's designated lanyard attachment point. If an operator finds that a 3 foot lanyard does not provide enough length to allow for mobility while working in the aerial lift, the EH&S Department will be contacted for discussion of an alternative fall protection system.

10.4.4. Outriggers, if provided, must be used as recommended by the manufacturer.

10.4.5. Unless recommended for such use by the manufacturer, no extensible boom aerial lift or bucket is to be used with the wheels located on an inclined surface. No unit may be used on an incline over 5% or in winds over 25 mph.

10.4.6. All units must have upper and lower control devices.

10.4.7. Units equipped with outriggers must not be relocated while personnel are on the work platform or in the bucket in an elevated position. Personnel must not be elevated on the work platform or in the bucket without the stability of outriggers.

10.4.8. All units must be inspected prior to each shift's use. The inspector must sign and date the logbook and note any discrepancies. Inspections must include all items recommended by the manufacturer's manual.

10.4.9. All units must receive preventive maintenance at intervals no longer than recommended in the manufacturer's manual. Copies of all inspections, preventive maintenance, and work reports must be retained for two years following a subsequent inspection or maintenance activity.

10.4.10. Travel of units while employees, materials, tools, or equipment occupy the platform or bucket in an elevated position is not permitted.

(Exception: Employees may ride in the platform for short moves at the work location if the platform is lowered to the cradle position and the employees face the direction of movement; if the travel surface is substantially level; and if there are no significant holes or obstacles in the path of travel.)

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11.0 BUILDING and OFFICE SAFETY

11.1. General Guidelines: The following rules apply to all buildings including offices, shops, warehouses, or similar structures.

11.2. Filing Cabinets: The contents of filing cabinets must be arranged and distributed so as not to make the cabinet top heavy.

11.3. Drawers: The drawers on file cabinets, desks, and toolboxes, etc. must be closed when not in use or when unattended. Do not have more than one drawer open at one time.

11.4. Paper Cutters, etc.: Exercise caution when operating paper cutters, trimmers, scissors, paper punches, and staplers. Keep fingers clear of the cutting blades and make sure blade guards are in place. Cutting edges should be maintained in good condition.

11.5. Defects: Report any sharp edges, splinters or defective parts on office equipment so repairs can be made. If unsafe conditions occur, appropriate action must be taken.

11.6. Cords: Permanent installations of telephone, computer network, and electrical cords must be encased in walking areas and secured out of the way under desks. Temporary cord installations must be protected to prevent trips and falls. All phone, electronic, computer, conference calling intercoms, and electrical cords must be neatly tied and stored to prevent damage, entanglement, and tripping.

11.7. Chairs and Benches: Do not stand on chairs and benches. Unsafe chairs or benches must not be used. Chairs must not be repaired or altered in any manner except by an authorized repair service. While seated in a chair, all chair legs must remain in contact with the floor. Tilting or leaning back while seated in a chair is prohibited.

11.8. Criminal Activity: Immediately contact CAP Protective Services or local law enforcement to report any criminal activity or suspected criminal activity on CAP property. This includes but is not limited to, trespassing, theft, burglary, assault, vandalism and arson to buildings, offices and employees.

11.9. Protruding Nails: Protruding nails or screws must be removed. Particular care must be used to remove protruding nails and screws in walkways and areas where others may not observe them. Care should be taken to use the appropriate tools to remove protruding nails and screws. Assistance should be requested if proper tools are not available.

11.10. Turning on Lights/Power: Lights must be turned on immediately upon entering a dark area or room. If fixed lighting is not available temporary lighting must be used. If unusual odors are noticed when entering a building or structure, do not turn on lights or power and leave the area. Report the condition to a Supervisor or Manager.

(Example would be the rotten egg odor in natural gas).

11.11. Warning Signs: Damaged signs and labels on machines, equipment, electrical boxes, or other apparatus should be replaced. Danger signs must be placed at locations where there are exposed energized circuits. Do not operate machinery, equipment, switches, valves, or other apparatus with attached danger signs, tags, or banners.

11.12. Emergency Exits, Fire Extinguishers, First Aid Supplies: All emergency exits, fire extinguishers, first aid kits and other emergency items must be kept clear of obstructions. (Reference to safety rule 9.9.1)

11.13. Signage: All emergency exits, fire extinguishers, first aid kits, emergency response information, and other emergency items should be properly marked as to location. Non-exit doorways must be mark "Not an Exit".

11.14. Cleaning and Mopping Floors: Employees mopping or waxing floors must put warning signs in place to warn co-workers of the potential for slippery floors. All liquid spills must be cleaned up immediately.

11.15 Office Equipment: Keep flammables and combustible material away from all heat producing equipment such as copiers, scanners, printers, faxes, laminators, portable heaters, coffee makers, hot plates, microwaves, and toaster ovens. Do not store flammable and combustible material on top of or near heat producing equipment. Be sure to turn off/unplug kitchen appliances after use.

All appliances used at CAP must be UL approved.

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12.0 MATERIAL HANDLING and STORAGE

12.1. General: Materials must be stored in a planned and orderly manner, so as not to endanger the safety of employees. Use caution when transporting or storing pressurized spray cans in CAP vehicles. Temperature extremes can cause the can to explode.

All containers must be properly labeled in accordance with Hazard Communication requirements. This includes fuel cans that store gasoline and diesel fuels. Solvents and lube oils may not be stored in gas cans.

12.1.1. Storage of material is strictly prohibited in pumping plant elevator chases with the exception of metal scaffold material.

12.1.2. When storing hazardous materials consideration must be given to the chemical characteristics to prevent the mixing of incompatible products. Hazardous Material Storage must comply with the applicable regulatory standards for the product. This includes maximum quantities to be stored in cabinets, rooms, and containers.

12.1.3. Hazardous materials such as sodium hypochlorite and muriatic acid are required to be stored in separate corrosive cabinets to prevent the mixing of incompatible chemicals. The maximum storage of hazardous materials in a corrosive cabinet is 60 gallons. Unopened 5-gallon buckets of sodium hypochlorite may be staged in chlorinator rooms outside of a corrosive cabinet.

12.1.4. Above ground and below ground storage tanks must be marked according to CFC Standard 79-3.

12.2. Open Yard Storage: Outside storage of materials must comply with the following:

12.2.1. Combustible materials must be stacked securely, and stacks or piles must not exceed 16 feet in height.

12.2.2. Driveways between and around combustible storage piles must be at least15 feet wide and must be maintained free from accumulations of material or rubbish. Large stockpiles of material must be planned with a maximum grid system unit of 50 by 150 feet.

12.2.3. Materials must not be stored under overhead power lines.

12.3. Indoor Storage: Inside storage of materials must comply with the following:

12.3.1. Stacks, tiers, and piles must be stable, and stacked to facilitate safe handling and loading. Storage of hazardous materials must be in accordance with the requirements contained in the SDS for the product(s).

12.3.2. Materials must not be placed or stored so as to interfere with access ways, doorways, or hoist ways. Accumulations of scrap or materials must not be permitted to obstruct access ways and exits. Aisle width must be adequate to accommodate firefighting equipment.

12.3.3. Materials must be stored, handled, and piled with consideration for their fire characteristics. Non-compatible materials which may create a fire hazard must be separated by a distance of at least 25 feet or isolated by a barrier having at least a 1-hour fire rating. Material must be stored to minimize the spread of fire internally and to provide convenient access for firefighting.

12.3.4. A clearance of 24 inches must be maintained around the path of travel of fire doors.

12.3.5. Clearance of at least 18 inches must be maintained between stored materials and sprinkler heads.

12.3.6. Fire protection must be furnished in compliance with National Fire Protection Association (NFPA) standards and as specified in other parts of this section.

12.3.7. Except for floors or slabs on grade, the maximum safe load limits in pounds per square foot must be conspicuously posted in all indoor storage areas and must not be exceeded.

12.3.8. Materials stored inside buildings under construction must not be placed within 6 feet of any hoist way or inside floor openings, nor within 10 feet of an exterior wall, which does not extend above the top of the material stored.

12.4. Bagged Material: Bagged materials must be stacked by stepping back the layers and cross-keying the bags at least every 10 bags high, except when restrained by walls or partitions of adequate strength.

12.5. Bulk Storage: Silos, hoppers, tanks, bins, and similar bulk storage containers are considered confined spaces. No employee will enter such spaces until the appropriate requirements in the CAWCD Permit Required Confined Space Entry Program are implemented.

12.6. Lumber: Lumber must be handled and stacked per the following:

12.6.1. Lumber must be stacked on level and solidly supported sills so that the stacks are stable.

12.6.2. Lumber piles must not exceed 12 feet in height.

12.7. Bricks and Masonry Blocks: Bricks and masonry blocks must be handled and stacked per the following:

12.7.1. Brick and masonry blocks must be stacked on level and solid surfaces.

12.7.2. Brick stacks must not exceed 7 feet in height. When a loose brick stack reaches a height of 4 feet, it must be stepped back at least 2 inches in every foot of height above the 4-foot level. Unitized brick must not be stacked more than three units in height.

12.7.3. Masonry blocks stacked higher than 6 feet must be stepped back one-half block per tier above the 6-foot level.

12.8. Cement and Lime: Cement and lime must be handled per Safety Rule 12.3 if applicable and the following:

12.8.1. Employees handling cement or lime must participate in a Job Safety Analysis (JSA) including exposure determination. In addition proper hand washing facilities must be provided to minimize potential exposure to items contained in residual dusts such as Hexavalent Chromium as outlined in OSHA Hazard Bulletins.

12.8.2. Employees must wear appropriate personal protective equipment as specified in section 8 and identified in the (JSA). Washing facilities, hand-cream, petroleum jelly, or similar preparations for protection from dermatitis must be provided.

12.8.3. Un-slaked lime must be stored in a dry area, and due to fire hazard, must be separated from other materials.

12.9. Reinforcing, Sheet, and Structural Steel Reinforcing, sheet and structural steel must be handled and stored per the following:

12.9.1. Steel must be safely stacked to prevent sliding, rolling, spreading, or falling.

12.9.2. When steel is handled by a crane or forklift, lagging must be used to facilitate safe rigging.

12.10. Pipe, Conduit, and Cylindrical Material: Pipe, conduit and cylindrical material must be handled per the following:

12.10.1. Pipe, conduit bar stock, and other cylindrical materials must be placed in racks, or stacked on a firm, level surface and blocked to prevent spreading, rolling, or falling. Either a pyramided or battened stack must be used. Battened stacks must be stepped back at least one unit per tier and securely chocked on both sides of the stack.

12.10.2. Removal of pipe or conduit from a stack must be done from the ends of the pipe or conduit.

12.10.3. Unloading from a carrier must be done in such a manner that no person must be exposed to the unsecured load.

12.10.4. Storage of pipe, conduit bar stock or other materials must not impede walkways or doorways.

12.11. Wood Poles and Piling: Wood poles and piling must be handled per the following:

12.11.1. Wood poles and round piling must be stacked and handled as specified in subsection 12.9.

12.12. Sand, Gravel and Crushed Stone: Sand, gravel, and crushed stone must be handled per the following:

12.12.1. Stockpiles must be located so as to provide safe access for withdrawing material. Material must not be removed in such a manner that destabilizes the stockpile.

12.12.2. Material stored against walls or partitions must not be stored in an amount that will endanger the stability of the wall or partition.

12.13. Flammable and Combustible Liquids: Flammable chemicals must be placed in a flammable cabinet at the end of each work day. Flammable and combustible liquids must be handled per the following:

12.13.1. Unless defined herein, terms used throughout this subsection must convey the meaning specified in the flammable and combustible liquids code, NFPA 30, or 29 CFR 1910.106.

12.13.2. For the purpose of their use at CAP, flammable and combustible liquids are classified as follows:

1. Flammable liquids (Class I liquids)

- **Class I**---Liquids having a flashpoint below 100° F (38° C)
- **Class IA**---Flashpoint below 73° F (23 ° C) and boiling point below 100° F (38° C) – See 12.14 below.
- **Class IB**---Flashpoint below 73° F (23 ° C) and boiling point at or above 100° F (38° C)
- **Class IC**---Flashpoint at or above 73° F (23° C) but below 100° F (38° C)

2. Combustible liquids (Class II and III liquids)

- **Class II**---Liquids having a flashpoint at or above 100° F (38° C) and below 140° F (60° C)

- **Class III**---Flashpoint at or above 140° F (60° C)

12.14. Flammable and Combustible Liquid Storage: Flammable and combustible liquids may be stored and used in the original DOT shipping containers, as shown in table 12-1. However, the quantity in the work area must not exceed 1-day's usage, up to a maximum of 25 gallons of a Class 1A liquid or a maximum of 120 gallons of any other class of liquid. If flammable and combustible liquids are dispensed and used in smaller quantities, they must be dispensed into properly labeled approved safety containers. Exception: Liquids which are highly viscous (extremely hard to pour) may be stored and handled in any size original container.

12.14.1. Due to the extreme explosion hazard of Class IA liquids, they must not be purchased until storage, dispensing, and use procedures have been approved by the EH&S Department. Wherever practical, a less hazardous product must be used.

12.14.2. Personnel who use Class IA liquids must be trained in their storage, dispensing, and use, including design of the storage and dispensing system.

Table 12-1 - Maximum Allowable Size of Containers and Portable Tanks Combustible Flammable Liquids

Container type	Class IA	Class IB	Class IC	Class II	Class III
Glass	1 pt	1 pt	1 pt	1 pt	15 gal
Metal (other than approved Dot Drums) or approved plastic	1 gal	5 gal	5 gal	5 gal	5 gal
Safety Cans	2 gal	5 gal	5 gal	5 gal	5 gal
Metal Drums (DOT Spec)	60 gal	60 gal	60 gal	60 gal	60 gal
Approved Portable Tanks	660 gal	660 gal	660 gal	660 gal	660 gal
Polyethylene DOT spec 34, or as authorized by DOT exemption	1 gal	5 gal	5 gal	60 gal	60 gal

12.14.3. Safety Can: "Safety can" means an approved container of not more than 5-

gallon capacity having a spring- closing lid, spout cover, internal safety screen, and so designed that it will safely relieve internal pressure when subjected to fire exposure. Safety cans must be labeled in accordance with Hazard Communication requirements.

12.14.4. Drum/Barrel: The term "drum" or "barrel" means an approved container having a capacity greater than 5 gallons and no more than 60 gallons.

12.14.5. Portable Tanks: The term "portable tank" means an approved closed storage vessel having a capacity over 60 gallons and no more than 660 gallons and not intended to be a fixed installation.

12.14.6. Tanks: The term "tank" means an approved storage vessel having a capacity exceeding 660 gallons.

12.14.7. Only storage cabinets meeting NFPA and OSHA requirements may be used for the storage of flammables and combustibles. All cabinets must be labeled in conspicuous lettering "FLAMMABLE---KEEP FIRE AWAY."

1. **Approved cabinets:** Flammables and combustible must be properly stored per the following:

- Flammable and combustible liquids will not be stored indoors except as follows:
- No more than 25 gallons must be stored outside of approved cabinets in a room or single fire area. (refer to rule 12.13.2)
- No more than 60 gallons of Class I or II liquids, nor more than 120 gallons of Class III liquids, may be stored in an approved cabinet. No more than three such cabinets may be located in a single fire area.
- Larger quantities may be stored in separated indoor storage areas when a competent person certifies such storage.
- At least one 2-A:40 B-C fire extinguisher must be located not less than 10 feet nor more than 25 feet from the stored material, cabinet or entrance to the inside storage area.

2. Flammable and combustible liquids will not be stored outdoors except as follows:

- Above ground in approved containers not exceeding 60 gallon capacity subject to the following restrictions:

- Any one group of containers stored together must not exceed 1,100 gallons. Each group of containers must be separated by at least 5 feet and no group must be within 25 feet of any building or other combustibles.

- Each group of containers must be located adjacent to an access way at least 12 feet wide to facilitate the use of firefighting equipment.

(a) Stored above ground in approved portable tanks not exceeding 66-gallon capacity providing:

- A five-foot clear area separates those groups of two or more tanks having a combined capacity over 2,200 gallons.
- Portable tanks are not located within 25 feet of a building or combustible material.
- Portable storage tanks are equipped with emergency venting and other devices as required in NFPA 30.
- Each tank is located adjacent to an access way at least 12 feet wide to facilitate use of firefighting equipment.

(b) Above ground in approved tanks installed in accordance with NFPA Section 2-2, "Installation of Outside Above Ground Tanks."

- Storage areas must be diked at least 12 inches high, or graded and sloped, and sealed with a 50 mil plastic or equivalent liner to permit containment of leaks and spills equal to the capacity of all tanks and/or containers located in each area.
- Further, the area is maintained free of weeds or combustible material to a distance of 10 feet out from the storage area perimeter.
- At least one portable fire extinguisher rated not less than 2-A:40-B:C unit is located not less than 25 feet nor more than 75 feet from each portable tank or group of tanks or containers located outside.

12.15. Handling and Dispensing Flammable or Combustible Liquids: The following rules must be complied with when handling and dispensing flammable or combustible liquids.

12.15.1. Areas in which flammable or combustible liquids are transferred in quantities greater than 5 gallons at a time must be separated from other operations by at least 25 feet, or by a partition having a minimum 1-hour fire rating. Drainage or an equally effective method must be used to contain spills.

12.15.2. Adequate natural or mechanical ventilation must be provided in order to maintain the concentrations of flammable vapor below 10 percent of the lower flammable limit.

12.15.3. The transfer of Class I and Class II flammable liquids from one container to another requires bonding and grounding of the containers and the transfer system. All dispensing systems must be electrically grounded and bonded.

12.15.4. Flammable and combustible liquids must be drawn from or transferred into vessels, containers, or tanks, only (1) through a closed piping system, (2)

from safety cans, (3) by means of a device drawing through the top, or (4) from containers or tanks by gravity or pump through a self-closing valve. Transferring by injecting pressurized air into a tank or container is prohibited.

12.15.5. Electrical lighting must be the only means used to provide artificial illumination in areas where Class I flammable liquids are handled or dispensed, or where flammable vapor may be present. The wiring and all electrical equipment must meet the requirements of NFPA designation: Class I, Division 2, of the National Electrical Code.

12.15.6. At least one 2-A:40-B:C fire extinguisher must be located not less than 10 feet nor more than 25 feet from the stored material, cabinet, or entrance to the inside storage area.

12.15.7. Class I and II liquids must be kept in covered containers when not in use.

12.15.8. Open flame, smoking, or other sources of ignition must not be permitted within a distance of 50 feet from areas where Class I and Class II flammable liquids are dispensed or used. Greater distance may be necessary under some conditions. Approved "No Smoking" signs must be posted in such areas.

12.15.9. Leakage or spillage of flammable or combustible liquids must be cleaned up promptly and disposed of safely.

12.15.10. Self-closing metal refuse containers must be available in all areas where flammable or combustible liquids are dispensed or used.

12.16. Refueling: The following rules must be complied with while refueling.

12.16.1. Tanks and equipment used for refueling vehicles and equipment, fueled with flammable or combustible liquids must be designed and installed in accordance with the applicable provisions of the NFPA Standards, Underwriters Laboratories, Inc., or Factory Mutual Standards, or have the approval of the Government agency having jurisdiction.

12.16.2. Tank trucks must comply with the requirements published in NFPA 385, "Standard for Flammable and Combustible Liquid Tank Vehicles."

12.16.3. Hoses used to dispense flammable and combustible liquids must be an approved-type with an automatic self-closing valve or nozzle without a latch-open device. A hanger or hose retracting system will be provided to protect the hose from traffic abuse.

12.16.4. Electrical wiring, pumps, and equipment must meet the appropriate requirements of NFPA designation: Class I of the National Electrical Code. Clearly identified and accessible switches must be provided at a location

remote from dispensing devices to shut off all power to devices in an emergency.

12.16.5. Vehicles or equipment using gasoline, LPG, or other flammable or combustible liquid fuels must be shut down during refueling. Diesel equipment is excepted when fueled in accordance with manufacturer's recommendations. Stationary refueling tanks and/or dispensing islands and pumps must be protected against vehicular damage by guardrails or posts.

12.16.6. A standard "No Smoking" sign must be posted on all mobile refueling equipment and in established refueling areas.

12.17. Paints, Varnishes, and Thinners: Paints, varnishes, and thinners must be stored and used per the following:

12.17.1. Paints, varnishes, lacquers, thinners, and other volatile paints or coatings must be stored and dispensed in accordance with their flammability characteristics. Refer to rule 12.13.

12.17.2. Containers must be tightly closed when not in use and not more than a 1-day supply must be stored in buildings under construction.

12.17.3. Ventilation adequate to prevent the accumulation of flammable vapors in hazardous concentrations must be provided in areas where paints and coatings are dispensed or applied.

12.17.4. No smoking, open flame, exposed heating elements, or other sources of ignition must be permitted in areas where flammable or combustible paints or coating are being sprayed. Spray-painting booths and equipment must be in accordance with NFPA 33, "Standard for Spray Application Using Flammable and Combustible Materials."

12.17.5. Employees exposed to paints or coatings potentially hazardous to his/her health must have exposure determinations made to document exposure and when appropriate must be provided with and must use appropriate protective equipment.

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13. EXCAVATIONS

13.1. Competent Person: All excavation work must be performed under the direction of a competent person. This person has the knowledge to recognize existing and predictable hazards of excavations and has the knowledge and authority to take corrective actions to protect employees. The competent person is responsible for performing frequent and periodic inspections of the jobsite for hazards.

13.2. Site Preparations: Before opening any excavation, all interferences such as trees, sidewalks, and foundations must be removed or supported as necessary to protect employees and the public. A CAP dig permit will be executed prior to digging any excavation or trench.

13.3. Underground Utilities: The following rules are to protect CAWCD employees from injuries caused by underground utilities.

13.3.1. The estimated location of utility and other underground installations that may be encountered during excavation work must be determined by CAWCD engineering prior to opening an excavation.

13.3.2. When excavation operations approach the estimated location of underground installations, the exact location of the installations must be determined by safe and acceptable means, usually by hand digging with an insulated shovel and the use of suitable gloves.

13.3.3. If electric cables are damaged, the following steps must be taken:

1. If the damaged cable belongs to a utility other than CAWCD, the utility must be notified at once.

2. The area must be barricaded and unauthorized persons kept out until hazardous conditions can be eliminated.

13.3.4. If gas lines are damaged, the following steps must be taken:

1. The excavation must be left open to allow the gas to dissipate into the atmosphere. All possible sources of ignition must be removed or eliminated.

2. The local fire department must be notified immediately.

3. Residents in the immediate area must be warned and the public must be kept clear of the area.

4. The gas company must be notified at once.

5. The local police department must be notified

13.3.5. If communication cables are damaged, the Communications Company must be notified are once.

13.3.6. While the excavation is open, underground installations must be protected, supported or removed to safeguard employees.

13.4. Pedestrian Safety: Personnel working on foot in and around excavations must be aware of hazards from moving equipment, overhead loads, and spillage of loose materials.

13.4.1. Employees exposed to vehicular traffic must wear reflective vests or other suitable garments that comply with ANSI 107, Class 3.

13.4.2. No employee must be permitted under loads handled by lifting or digging equipment. Employees must stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.

13.5. Egress: A stairway, ladder, ramp or other safe means of egress must be located in trench excavations that are 4 feet or deeper. Egress must be located such that employees must not have to travel more than 25 feet to reach a means of egress.

13.6. Operating Equipment near Excavations: When mobile equipment is operated adjacent to an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades or a spotter must be utilized. If possible, the grade should be away from the excavation.

13.7. Accumulated Water: Employees must not work in excavations in which there is water or in excavations in which water is accumulating unless precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees vary with each situation, but could include special support or shield systems to protect from cave-ins and/or water removal to control the level of accumulating water.

13.8. Drainage: If excavation work interrupts the natural drainage of surface water (e.g. streams), diversion ditches, dikes, or other suitable means must be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

13.9. Support of Nearby Structures: Where the stability of adjoining buildings, walls or other structures is endangered by excavation operations, the Engineering Department must approve appropriate support systems.

13.10. Loose Debris: Employees must be protected from excavated material or equipment that could fall or roll into excavations. Protection must be provided by placing and keeping such materials or equipment at least two feet from the excavations or by the

use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into the excavation.

13.11. Inspections: Daily (or as the situation warrants, more frequent) inspections of excavations, the adjacent areas, and protective systems must be made by a competent person for evidence of a situation that could result in possible cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection must be conducted before starting work and as needed throughout the shift. Inspections must also be made after every rainstorm. Where the competent person finds evidence of a situation that could result in a possible cave-in, failure of a protective system, or other hazardous conditions, the competent person must remove the exposed employees from the hazardous area until the necessary precautions have been taken to ensure their safety.

13.12. Crossings: Where employees are required or permitted to cross over excavations, walkways or bridges with standard guardrails must be provided.

13.13. Open Excavations: The following rules apply to excavations which are left open overnight or when employees leave the work area.

13.13.1. When excavations are left open, warning devices such as barricades or guardrails must be placed to adequately protect the public and employees.

13.13.2. At the end of each workday, as much of the excavation as practical must be closed. No more trenches must be left open than is necessary.

13.13.3. When it is necessary to leave excavating equipment unattended, the blade, bucket or scoop must be lowered to the ground and the ignition system locked.

13.14. Street Traffic: Proper warning devices must protect mechanical excavating equipment that is parked or operating on streets or highways.

13.15. Protective Systems: Each employee in an excavation 5 feet or greater in depth must be protected from cave-ins by a protective system. This system must be either sloping/benching, shoring, shield system or other engineered system. Excavations less than 5 feet in depth may require protective systems when, based on the competent person's inspection, an indication of potential collapse or cave-in is present. Protective systems must also include and protect employee access routes (either by ramp or ladder).

13.15.1. When considering a protective system, the competent person must take into consideration soil type, vibration sources, previously disturbed soil, layered soil, presence of water, heavy equipment work adjacent to the excavation, limited work area, and other hazard-increasing conditions.

13.15.2. Shoring and shield systems must be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the shoring or shield systems.

13.15.3. Hydraulic shoring must be installed according to the manufacturer's design data. This design data must be available on site during use of the shoring.

13.15.4. Removal of shoring systems must begin at and progress from the bottom of the excavation. Members must be released slowly as to note any indication of possible cave-ins of the side of the excavation or possible failure of remaining members.

13.15.5. Shields must be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of a sudden lateral load.

13.15.6. Employees must not be allowed in shields when shields are being installed, removed or moved vertically.

13.15.7. Excavations deeper than 20 feet deep must have their protective systems designed and approved by a registered professional engineer and must be approved by both the CAWCD Engineering and Safety & Health Departments.

13.16. Applicable Standards: Excavations and all protective systems must comply with §29 CFR 1926 Subpart P, the OSHA standard for excavations. Competent persons must review and utilize applicable sections of this subpart and its appendices. Where conflict exists between these rules and subpart P; the more stringent (protective of employees) rule must apply.

13.17. Employee Training: Employees working in an excavation must be trained to recognize hazards of excavations (e.g. moving machinery, potential cave-ins, collapse) and the protective systems and methods used to mitigate these hazards. Supervisors and competent persons will ensure that employees are appropriately trained prior to working in excavations.

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14.0 MACHINERY AND MECHANIZED EQUIPMENT

14.1. General: Tools and materials must be secured to prevent movement

14.2. Initial Inspection: Before any machinery or mechanized equipment is placed in use, it must be inspected and tested by a competent person and certified to be in safe operating condition. Inspection and tests must be in accordance with the manufacturer's recommendations and must be documented.

The manufacture's operating manual or equivalent for the specific make and model of the equipment must be immediately available to the operator.

14.3. Daily Inspection: All machinery and equipment must be inspected daily (when in use) to ensure safe operating conditions as per manufacturer's instructions. Tests must be made to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place and functional.

14.4. Out of Service Tags: Whenever machinery or equipment is found to be unsafe, or whenever a deficiency, which affects the safe operation of equipment, is observed, the equipment must be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.

14.4.1. A tag indicating that the equipment must not be operated must be placed in a conspicuous location on the equipment. Where necessary, a special condition (gold) lock can be placed on the equipment controls or energy source to prevent operation of the equipment.

14.4.2. The tag must remain in its attached location until the equipment is safe to operate and removed by the person who placed it

14.4.3. When corrections are complete, the machinery or equipment must be inspected and tested per manufacturer's recommendations prior to being returned to service.

14.5. Qualified Personnel and Safe Practices: Only designated qualified personnel must operate machinery and mechanized equipment.

14.5.1. Machinery or equipment must not be operated in a manner that will endanger persons or property nor must the safe operating speeds or loads be exceeded.

14.5.2. Getting off or on any equipment while it is in motion is prohibited.

14.5.3. Machinery and equipment must be operated in accordance with the manufacturer's instructions and recommendations.

14.5.4. Seat belts must be worn on all equipment where provided.

14.5.5. Mounting or dismounting a vehicle. Use of the 3- POINT CONTACT technique is required. This requires three of four points of contact (Two hands and one foot OR both feet and one hand.)

14.5.6. Vehicle Lifts: Operators of automotive lifts must be instructed in the safe use and operation of the lift using the manufacturer provided instructions and warning labels.

14.5.7. Vehicle Lifts: Permanent vehicle lifts must undergo an annual inspection by an automotive lift inspection company. CAP Personnel will perform daily, weekly, and monthly inspections and preventative maintenance.

14.5.8. Manufacturer provided Operations and Maintenance Manuals must be kept with each piece of machinery, aerial lift, and other heavy equipment.

14.5.9. Per the "Fleet Maintenance Vehicle Lock-out/Tag-out Procedures", all sources of hazardous energy must be isolated and secured whenever service, inspection, maintenance or modification is to be performed.

14.5.10. Compressed Air Nozzles. Compressed air nozzles must restrict pressure to 30 psi. Compressed air should not be used to clean personnel or machinery such as drill presses, lathes, or bench grinders.

14.6. Manufacturer's Recommendations: When the manufacturer's instructions and or recommendations are more stringent than the requirements of CAP's, Safety Resource Manual, the manufacturer's requirements must apply.

14.7. Road Conditions: Inspections or determinations of road conditions and structures must be made in advance to ensure that clearances and load capacities are safe for the passage or placing of any machinery or equipment.

14.8. Equipment Requirements: The following rules must be complied with at all times when operating equipment.

14.8.1. Seats or personal protection equipment must be provided for each person required to ride on equipment.

14.8.2. Equipment operated on the highway must be equipped with headlights, taillights, brake lights and backup light and turn signals visible from front and rear.

14.8.3. All equipment with windshields must be equipped with powered wipers. Vehicles that operate under conditions which cause fogging or frosting of windshields must be equipped with operable defogging or defrosting devices.

14.8.4. Mobile equipment, operating within an off-highway job site not open to public traffic, must have a service brake system and a parking brake system

capable of stopping and holding the equipment while fully loaded on the grade of operation.

14.8.5. In addition, heavy-duty hauling equipment must have an emergency brake system, which will automatically stop the equipment upon failure of the service brake system.

14.8.6. The emergency brake system must be operable from the driver's position.

14.9. Maintenance: The following rules must be complied with at all times when performing maintenance activities on machinery and mechanized equipment.

14.9.1. Maintenance, including repairs and preventative maintenance must be in accordance with the manufacturer's recommendations and must be documented. Records of maintenance and repairs must be maintained for the life of the equipment.

14.9.2. All machinery or equipment must be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designated to be serviced while running is exempt from this requirement.

14.9.3. All repairs on machinery or equipment must be made at a location which will protect repair personnel from traffic.

14.9.4. Heavy machinery, equipment, or parts thereof which are suspended or held apart by slings, hoist, or jacks must be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

14.10. Blocking and Braking of Parked Vehicles: Bulldozer scraper blades, end loader buckets, dump bodies, and similar equipment must be either fully lowered or blocked when repaired or when not in use. All controls must be in the neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

14.11. Chocking of Trailer Wheels: When trailers are not equipped with self-setting brakes, and are parked and detached from the towing vehicle, they must be secured by the use of chocks and the lowering of the leveling stand. Chocks must, at a minimum, be set against both sides of at least one wheel on single axle trailers and against the outside edge of at least one wheel of each axle on multiple axle trailers.

14.12. Equipment Leveling: Stationary machinery and equipment must be placed on a firm foundation and secured before being operated.

14.13. Illumination: All mobile equipment and the areas where they are operating must be adequately illuminated while work is in progress.

14.14. Enclosed Areas: Equipment powered by an internal combustion engine must not be operated in an enclosed area unless adequate control is provided to ensure that the equipment does not generate a hazardous atmosphere.

14.15. Slow Moving Vehicle Lights: All vehicles which will be parked or moving slower than normal traffic on haul roads must have a flashing yellow light or four-way flashers visible from all directions.

14.16. Cab Protection During Loading: Personnel must be allowed in truck cabs during loading only if the truck has built- in cab protection.

14.17. Towing: All towing devices used on any combination of equipment must be structurally adequate for the weight drawn and securely mounted.

Persons must not be permitted to get between a towing vehicle and the piece of towed equipment until both have been completely stopped with all brakes set and wheels chocked in both vehicle and equipment.

14.18. Parking: The following rules must be observed when parking equipment.

14.18.1. Whenever equipment is parked the parking brake must be set.

14.18.2. Equipment parked on an incline must have the wheels chocked or track mechanisms blocked and the parking brake set.

14.18.3. All equipment left unattended at night, adjacent to a highway in normal use or adjacent to construction areas where work is in progress, must have lights or reflectors or barricades equipped with lights or reflectors.

14.19. Modifications: No modifications or additions which affect the capacity or safe operation of machinery or equipment must be made without the manufacturer's written approval.

14.19.1. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags or decals must be changed accordingly.

14.19.2. In no case must the original safety factor of the equipment be reduced.

14.20. Steering and Spinner Knobs: Steering or spinner knobs must not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering hand wheel to spin. When permitted, the steering knob must be mounted within the periphery of the wheel.

14.21. Industrial Trucks: All industrial trucks must meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation, defined in ANSI/ASME B56.1, Safety Standards for Low Lift and High Lift Trucks.

14.22. Rated Capacity: Lift trucks, stackers, and similar equipment must have the rated capacity posted on the vehicle so as to be clearly visible to the operator. When the manufacturer provides auxiliary removable counter weights, corresponding alternate rated capacities must also be clearly shown on the vehicle. The ratings must not be exceeded.

14.23. Operating Position: The controls of loaders, excavators, or similar equipment with folding booms or lift arms must not be operated from a ground position unless so designed.

14.24. Work Around Booms/Buckets: Pedestrian personnel must not work or pass under or ride in the buckets or booms of loaders in operation.

14.25. Fire Extinguisher: Each bulldozer, scraper, dragline, crane, motor grader, front-end loader, mechanical shovel, backhoe, and other similar equipment must be equipped with at least one dry chemical or carbon- dioxide fire extinguisher with a minimum rating of 5-B: C.

14.26. Fill Hatches; Fill hatches on water haul vehicles must be secured or the opening reduced to a maximum of 20 cm (8 in).

14.27. Reverse signal (back-up) alarm.: All self-propelled construction and industrial equipment, whether moving alone or in combination, must be equipped with a reverse signal alarm.

14.27.1. Equipment designed and operated so that the operator is always facing the direction of motion does not require a reverse signal alarm

14.27.2. Reverse signal alarms must be audible and sufficiently distinct to be heard under prevailing conditions.

14.27.3. Alarms must operate automatically upon commencement of backward motion. Alarms may be continuous or intermittent (not to exceed 3-second intervals) and must operate during the entire backward movement.

14.27.4. Reverse signal alarms are in addition to requirements for signal persons.

14.27.5. A warning device or signalperson must be provided where there is danger to persons from moving equipment, swinging loads, buckets, booms, etc.

14.28. Guarding: Guarding must be installed on machinery and mechanized equipment at all locations where there is a potential for injury.

14.28.1. All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating or moving parts of equipment must be guarded when exposed to contact by persons or when they otherwise create a hazard.

14.28.2. All hot surfaces of equipment, including exhaust pipes or other lines, must be guarded or insulated to prevent injury and fire.

14.28.3. All equipment having a charging skip must be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.

14.28.4. Platforms, foot walks, steps, handholds, guardrails, and toe boards must be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

14.28.5. Equipment must be provided with suitable working surfaces of platforms, guard rails, and hand grabs when attendants or other employees are required to ride for operating purposes outside the operator's cab or compartment. Platforms and steps must be of nonskid material.

14.28.6. Substantial overhead protection must be provided for the operators of forklifts and similar material handling equipment.

14.29. Fuel Tanks: Fuel tanks must be located in a manner that will not allow spills or overflows to run onto the engine, exhaust, or electrical equipment.

14.30. Exhaust: Exhaust or discharges from equipment must be so directed that they do not endanger persons or obstruct the view of the operator.

14.31. Safety Cage: A safety tire rack, cage, or equivalent protection must be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

14.32. Removal of Guards: No guard, safety appliance, or device should be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then only after the power has been shut off. All guards and devices must be replaced immediately after completion of repairs and adjustments and before power is turned on.

14.33. Seatbelts: Seat belts and anchorages meeting the requirements of 49 CFR 571 must be installed and worn in all motor vehicles. Two-piece seat belts and anchorages for construction equipment must comply with applicable federal specifications.

14.34. Overhead Guards: All high rider industrial trucks must be equipped with overhead guards which meet the structural requirements defined in paragraph 4.21 of ANSI/ASME B56.1, Safety Standards for Low Lift and High Lift Trucks.

14.35. Operator Protection: Suitable protection against the elements, falling or flying objects, swinging loads, and similar hazards must be provided for operators of all

machinery or equipment. Glass used in windshields or cabs must be safety glass.

14.36. Falling object protective structures (FOPS): All bulldozers, tractors, or similar equipment used in clearing operations must be provided with guards, canopies, or grills to protect the operator from falling and flying objects as appropriate to the nature of the clearing operations.

14.36.1. FOPS for other construction, industrial, and grounds-keeping equipment will be furnished when the operator is exposed to falling object hazards.

14.36.2. FOPS will be certified by either the manufacturer or a licensed engineer as complying with applicable Society of Automotive Engineers (SAE) recommended practices:

14.37. Rollover protective structures (ROPS): Seatbelts and rollover protective structures must be installed on:

- ✓ Crawler and rubber-tire tractors including dozers, push and pull tractors, winch tractors, and mowers;
- ✓ Off-the-highway/self-propelled/pneumatic-tire earthmovers such as trucks, pans, scrapers, bottom dumps and end dumps;
- ✓ Motor graders;
- ✓ Water tank trucks having a tank height less than the cab; and other self-propelled construction equipment such as front-end loaders, backhoes, rollers, and compactors.

ROPS are not required on:

- ✓ Trucks designed for hauling on public highways,
- ✓ Crane-mounted dragline backhoes,
- ✓ Sections of rollers and compactors of the tandem steel-wheeled and self-propelled pneumatic tired type that do not have an operator's station.
- ✓ Self-propelled rubber-tired lawn and garden tractors and side boom pipe laying tractors operated solely on flat terrain (maximum 10° slope; 20° slope permitted when off-loading from a truck) not exposed to rollover hazards, and
- ✓ Cranes, draglines, or equipment on which the operator's cab and boom rotate as a unit.

The operating authority must furnish proof from the manufacturer or certification from a licensed engineer that the ROPS complies with applicable SAE standards.

14.38. Lubrication Points: All points requiring lubrication during operation must have fittings so located or guarded to be accessible without hazardous exposure.

14.39. Load Limiting Devices: All machinery or equipment and material hoists operating on rails, tracks, or trolleys must have positive stops or limiting devices on the equipment, rails, tracks, or trolleys to prevent overrunning safe limits.

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15.0. SAFETY NEAR, OVER and ON the WATER

Working on, over or near the water can present special hazards and challenges for CAP and contractor employees. Water in the canal often moves faster than it appears. Checks, turnouts, fore bays, tunnels and siphons can be particularly dangerous, with a high potential for drowning if an employee falls in the water in one of those areas when water is flowing. Therefore, the following safety precautions shall be adhered to when working on the canal slope or over/on the water.

15.1. Definition(s):

15.1.1 **High-hazard zone**: Any location on the canal slope within 200 yards upstream of a fore bay, tunnel inlet, siphon inlet, check, turnout or similar structure, *when water is actively flowing*.

15.1.2 **Safety line**: A 3/8 inch rope (or equivalent) sufficiently anchored on both sides of the canal such that an employee who falls into the canal can hold onto this rope and be prevented from moving further downstream. Note: In most cases, the safety chains on the upstream side of checks, siphons, etc. are not a substitute for this safety line.

15.1.3 **Tethering system**: A system utilizing rope and other needed gear to ensure an employee who has fallen into the canal does not float downstream. A tethering system is not a fall protection or fall arrest system; therefore, rope, anchors and other components need only be sufficient to keep an employee from floating downstream. The rope can be slack and long enough to allow employees to move freely on the slope.

15.2. Working on a canal slope outside of a high-hazard zone: When work is performed on the canal slope outside of a high-hazard zone, the following requirements shall be followed:

15.2.1 Each employee on the slope must wear a personal floatation device (PFD).

15.2.2 At least one other employee must be in the vicinity to assist in the event of an emergency.

15.2.3 A ring buoy with a minimum of 90’ of 3/8” line attached must be present and readily accessible. If the work area is lengthy, additional buoys should be strategically located. (Throw bags may be used in addition to, but not as a substitute for ring buoys.)

15.2.4 A safety line must be placed across the canal approximately 10 yards downstream of the work area.

15.2.5 At least one employee trained in first aid and CPR must be available at the site.

Note: Where an employee is working alone and is utilizing a restraint system adjusted such that the employee ***cannot*** end up in the water, none of the above safety measures are required.

15.3. Working on a canal slope within a high-hazard zone: When work is performed on the canal slope within a high-hazard zone, the following requirements shall be followed:

15.3.1 Each employee must utilize one of the following:
- **o** A PFD and a tethering system, adjusted so that the employee cannot float into a siphon, turnout or similar area; *or*
- **o** A restraint system, adjusted and utilized in such manner that it will not permit the employee to end up – full body – in the water.

15.3.2 At least one other employee must be in the vicinity to assist in the event of an emergency.

15.3.3 A ring buoy with a minimum of 90' of 3/8" line attached must be present and readily accessible. If the work area is lengthy additional buoys may be required. (Throw bags may be used in addition to, but not as a substitute for ring buoys.)

15.3.4 At least one employee trained in first aid and CPR must be available at the site.

15.4. Working over water: When working more than four feet directly above the water surface (i.e., work at a check structure where an employee must cross over the guardrails), employees must utilize fall protection (a fall restraint or fall arrest system). A ring buoy with 90' of 3/8" line attached must also be present and readily accessible.

Exception: If an employee is working over the water from the basket of a JLG or similar type of articulating boom lift where tie off is normally required, the employee may work without tying off to the basket or lift. In such cases, the employee must wear a PFD.

15.5. Working on the water (i.e., from a boat or barge): When working on the water, the following requirements shall apply:

15.5.1 Each employee on the boat/barge must wear a personal floatation device.

15.5.2 Long pants, hats, and sunglasses are required protective wear. Gloves, hard hats and safety shoes may also be required, depending upon the nature of the operations.

15.5.3 No work may occur in a high-hazard zone without first consulting with the EH&S department for assistance in safely planning work within that area.

15.6. Diving Standards: CAP's 'Diving Standards' establish the requirements for contractor diving operations. A link is available on the next page of this manual, in the Safety Programs section.

(TOC)

(Main TOC)

SECTION 3

SAFETY PROGRAMS AND POLICIES

The following CAP safety and health programs are found in alphabetical order later in this resource manual, beginning here.

1. **Asbestos O & M Program**
2. **Bloodborne Pathogens Program**
3. **Confined Space Program**
4. **Diving: CAP Requirements**
5. **Electrical Safety Program**
6. **Fall Protection Program**
7. **Fire Safety Program**
8. **Forklift Program**
9. **Hazard Communication Program**
10. **Hazardous Energy Control Program**
11. **Hazardous Materials Transportation Security Plan**
12. **Hearing Conservation Program**
13. **Heavy Metals Exposure Control Program**
14. **Lead in Construction Program**
15. **Lower Santa Cruz Recharge Basis – Access Procedures**
16. **Machine Guarding Program**
17. **Personal Protective Equipment Program**
18. **Respiratory Protection Program**
19. **Thermal Stress Awareness Program**

(Main TOC)

SECTION 4

OSHA INFORMATION

The Occupational Safety and Health Act (OSHA) establishes requirements that all employers must comply with in regards to employee safety and health. Non- compliance can result in safety violations, which carry substantial fines. CAWCD must also comply with other OSHA and State statutes regarding injury and illness reporting, workers' compensation and related matters, including the following:

- **Report catastrophes and fatalities:** CAWCD is required to report to the local OSHA office any fatality within 8 hours. Additionally, we must report within 24 hours any accident that results in the hospitalization of one or more employees, an amputation, or the loss of an eye. This report can be made by telephone or fax.
- **OSHA Form 300:** A log and summary of Occupational Injuries and Illnesses. Injuries and illnesses must be recorded on this form within six days of their occurrence. An annual summary must be completed and posted in a conspicuous location from February 1 to April 30. The completed form 300 must be kept for five years.
- **Employee Exposure and Medical Records:** Records involving exposures to occupational health hazards must be kept for the term of employment plus 30 years.

OSHA INSPECTION GUIDELINES

The intent of this guideline is to ensure a uniform response and handling of any OSHA inspections at CAP facilities and to maintain effective relationships between CAP and federal and state OSHA and their Compliance Safety and Health Officers (CSHO).

Compliance inspections can occur due to a workplace accident, referral, complaint, or planned inspection. As a current VPP site and under the current guidelines of the Voluntary Protection Program, ADOSH should not schedule a planned inspection at CAP facilities.

To ensure a uniform and coordinated response, the following procedures should be followed in the event of an OSHA compliance inspection at CAP:

1. **Notification of Inspection:** Whenever a CSHO arrives on CAP property for the purpose of conducting an inspection, notification shall be made to the Director of Employee Services, the Environmental Health & Safety (EH&S) Manager and the Legal department. Receptionists and other employees who may have first contact with a CSHO **DO NOT have the authority to allow an inspection to proceed**. Instead, they should greet the CSHO politely, ask the CSHO to identify the purpose of the visit, and advise the CSHO that notification will be made to an appropriate CAP representative.

2. **CAP Representation During an Inspection:** A CAP representative shall accompany the CSHO at all times. In no case shall an inspection proceed until the proper notifications have been made, and a CAP representative is available to accompany the inspector. A "representative" is defined as:

a. The EH&S Manager or his/her designee.
b. The Director of Employee Services
c. Another department manager, as directed by the Director of Employee Services

3. **CAP Representative is Unavailable:** When a CAP representative is not available, the following will apply:

   a. The CAP employee(s) contacted by the CSHO will advise the CSHO **that they are not authorized to permit the inspection process to proceed**, but will immediately contact a CAP representative about the inspection.
   b. When contacted by a CAP employee, the CAP representative will talk to the CSHO, determine the nature of his/her visit, and see if the CSHO can delay the inspection until the arrival of the CAP representative. (Current OSHA guidelines allow for the inspector to wait a reasonable amount of time for such a representative.)
   c. If the CSHO is unwilling to delay the inspection until the arrival of CAP's authorized representative, the CAP representative may:

      - Designate a CAP employee to act as a temporary CAP representative until the authorized representative can arrive, or;

      - Advise the CSHO that CAP procedures require that a CAP representative attend the inspection and, because the CAP representative is presently unavailable, CAP must refuse permission for the inspection to proceed at this time.

4. **Inspection Documentation:** The CAP representative assigned to accompany the CSHO should be prepared to take notes and pictures pertaining to any inspection activity. If the CSHO intends to conduct personal exposure monitoring on any employee, CAP should attempt to conduct simultaneous exposure monitoring on the same employee(s). (This may not be possible due to calibration and or sampling media requirements.)

5. **Review of and Request for Documents:** As part of any inspection a CSHO may request to review a wide variety of CAP documents related to safety and health activities. These records are generally maintained at CAP Headquarters. Requests for such documents will be directed to the EH&S Department.

   A CSHO can review any pertinent documents upon request (i.e., SDSs, exposure monitoring records, etc.). However, CAP will provide copies of documents only after OSHA has provided CAP with a written request for such documents and after the request has been reviewed by the Legal Department. Note: For certain medical records a completed "Medical Access Order" (MAO), may be warranted.

The CAP representative will advise the CSHO that copies of requested documents will generally be provided within two or three working days. A log of all documents provided to the CSHO will be maintained in the EH&S Department

6. **Beginning the Inspection – Opening Conference**: The CAP representative should invite the CSHO to any office or similar place where the inspection can be discussed and the proper documents reviewed and/or completed.

   a. Identify the CSHO: Look at the CSHO's credentials and obtain a business card. Get the name and telephone number of the CSHO's supervisor.

   b. The CSHO must, as part of the opening conference, explain the purpose and scope of the inspection, particularly if he/she is there to investigate an accident or a complaint.

   c. The CSHO should also identify whether this is a safety inspection or health inspection. Health inspections are conducted by an Industrial Hygienist and may include air sampling to determine compliance with applicable exposure limits set by OSHA.

   d. If the inspection is to investigate an accident, complaint or referral, the CSHO should provide a written copy of the complaint or referral form, or define the accident to be investigated. They are initially limited to the scope of the accident, complaint or referral, and should not be allowed into other areas or activities. They do however, have the authority to expand the scope of the inspection as long as they have compelling reasons for doing so. In the event that the CSHO opts to expand the inspection they must inform the CAP representative that they are doing so and the reasons why.

   e. The CAP representative is to observe and note the behavior and actions of the CSHO and attempt to document questions posed by the CSHO as well as CAP's responses.

   f. Other employers/employees: The CSHO may ask if there are other people working on the premises who are not employed by CAP (i.e., contracted employees). If so, the CSHO will want to know who they are, what they do, and for whom they work. The CSHO may want to include these employers/employees in the opening conference.

7. **Ground Rules for the Inspection**: Treat the CSHO with respect. However, remember that this is your facility or operation and the CSHO is your guest. You must maintain control of the inspection.

   a. Whenever you are unsure about a question or a request made by the CSHO, ask for clarification. If necessary, **STOP THE INSPECTION** from proceeding any further until you can contact a member of the EH&S or Legal department for clarification or assistance.

b. Photographs / Videotapes: The CSHO will likely take photos or video of conditions found during the inspection. The CAP representative should take photos or video of the same conditions. If you believe the CSHO is taking a particular photograph which does not reflect the entire condition under investigation, take the same picture if possible, and then take a picture showing the entire condition. When photographs are taken, request concurrence from the CSHO that the photographs will be treated as confidential business information.

c. Demonstrations and Testing: The CSHO may ask to monitor employee exposures in the workplace. To do so, the CSHO will not only want to attach measuring devices to employee's clothing, but may also observe and monitor the employee's actions during this time to ensure the integrity of the sampling. Always ensure the EH&S manager and industrial hygienist are aware of any request to conduct personal monitoring.

A CAP employee that the CSHO wishes to monitor can refuse to participate in the monitoring. However, such refusal could be considered obstruction of the inspection process, resulting in the CSHO obtaining an inspection warrant. Unless there are safety or other compelling reasons for an employee to refuse to be monitored, cooperation with the monitoring is usually best.

d. Alleged violations. The CSHO may point out things he/she believes are OSHA violations. The CAP representative should simply make note of the alleged violation and have the CSHO explain what he/she believes is the basis for the suspected violation. Do not agree with, argue or express any opinions regarding alleged violations identified by the CSHO. Simply state the known facts. Do not guess or give opinions.

e. Interviews:

(1) Interviews with supervisors and managers: If possible, schedule the interview for some time after the walk around facility inspection is complete. Contact EH&S and Legal regarding the interview **BEFORE** agreeing to the interview. A CAP representative (preferably from the Legal Department) can and should be present during interviews with management employees.

(2) Interviews with CAP employees: The CAP representative should inform the employee that he/she is under no obligation to talk to the CSHO. Employee interviews are permitted under the OSHA Act, but if an employee does not want to talk with the CSHO, the employee may refuse without consequence. A CAP representative does not have the right to be present during an employee (non-management) interview, unless the employee requests such presence.

(3) The CAP representative should not allow any employee interviews to

unnecessarily obstruct the work schedule. The CSHO may ask employees to sign statements taken during the interview process. Employees should be informed that they are not obligated to sign any statements provided to OSHA.

f. Debriefing after Interviews**:** Immediately after an OSHA interview, all employees should be asked to write down the information provided to OSHA during the interview. If that is not possible, the CAP Representative should interview the employee and identify and record any information or documents provided to OSHA by the employee. *Caution needs to be taken here to ensure that the CAP representative does not do or say anything which may make the employee feel harassed or intimidated for speaking to the CSHO, thus triggering a discrimination complaint from the employee for participating in a protected activity under the OSHA act.*

g. Closing Conference: When the inspection has been completed, OSHA procedures call for a "closing conference" with the employer.

(1) The CSHO will use the closing conference to advise you of "apparent violations" that he/she has observed during the inspection. If the CSHO uses the word "violation" DO NOT agree with him/her. Ask the CSHO why he/she thinks there is a violation and try to find out what, in his/her opinion, would constitute a feasible means of abatement (fixing the conditions). The CSHO should also indicate whether or not the "alleged violation" constitutes a serious or non-serious threat to the employees. This will give the CAP representative more direction on the seriousness of the issue and potential for monetary fines.

(2) Tactfully try to correct incorrect assumptions, rationale or facts the CSHO may have developed during the inspection and may have used to develop the apparent violations. Get as many details on this point as you can, but do not argue or agree with the CSHO.

If the CSHO asked for an estimate on the amount of time it will take to correct a particular condition, politely state that you will consult with appropriate staff and get back to him/her with that information.

(3) Immediately after the closing conference, the CAP representative should schedule a conference call or meeting with CAP management to discuss the inspection findings. This call/meeting should include EH&S and Legal.

8. **Post Inspection Contacts**: Once the inspection is concluded, either with or without a closing conference, the CSHO will generate an inspection report. Prior to completing the report, the CSHO may telephone with a request for additional information and documents.

Only the CAP representative should speak with the CSHO**.** The CAP representative

should keep in mind that the CSHO is still seeking information that may result in violations. Therefore, the same rules apply as during the actual inspection. In particular, document requests must be made in writing. Notify EH&S and Legal of these additional requests by the CSHO.

9. **OSHA Citations**: The OSHA citations and proposed penalties will be sent by certified mail a few weeks or months after the inspection ends. Be sure the CSHO has the proper complete mailing address of where to send the proposed citations or other paperwork related to the inspection.

   Upon receipt of any OSHA citations and proposed penalties, immediately notify the EH&S and Legal departments. Remember that CAWCD only has 15 working days from the receipt of citations to schedule an informal conference and/or submit a notice of contest. Once the 15 working day period has expired, CAWCD loses any right to contest the citations.

   EH&S and Legal will work with CAP representatives to prepare a response to the OSHA citations and proposed penalties.

10. **Complaint investigations via letter, telephone, email and similar methods**: OSHA sometimes receives complaints from employees, past employees, and others alleging hazards in the workplace. OSHA can respond to these complaints in a number of ways, including sending a certified letter to the employer; telephoning the employer; or emailing the employer. In each case, the employer is advised of the complaint items and asked to respond, in writing, generally within ten (10) working days.

    CAP employees who receive such letters, telephone calls, or emails from OSHA must immediately notify their Manager and the EH&S Manager. Failure to respond properly to these complaint notifications will most likely cause an OSHA workplace inspection. EH&S and Legal will work with appropriate CAP Managers to prepare the response.

(Main TOC)

SECTION 5

PERSONAL PROTECTIVE EQUIPMENT

The warehouse stocks a variety of personal protective equipment (PPE). Photos and brief descriptions of that equipment can be found in the "PPE Inventory" folder in Content Server. Please note that this is not a comprehensive list. Check with your supervisor if you need PPE other than what is shown or what is stocked.

(Main TOC)

SECTION 6

GLOSSARY OF SAFETY TERMS

GLOSSARY

Absorption. The condensation of gases, liquids, or dissolved substances on the surfaces of solids.

Acceptable Entry Conditions. The conditions that must exist in a permit space to allow entry. In addition, *acceptable entry conditions* ensure employees involved with a permit-required confined space entry can safely enter into and work within the space.

ACGIH. American Conference of Governmental Industrial Hygienists, which develops and publishes recommended occupational exposure limits for hundreds of chemical substances and physical agents. See TLV.

Acid. Any chemical with a low pH that in water solution can burn the skin or eyes. Acids turn litmus paper red and have pH values of 0 to 6.

Action Level. Term used by OSHA and NIOSH to express the level of toxicant, which requires medical surveillance, usually one half of the PEL.

Activated Charcoal. Charcoal is an amorphous form of carbon formed by burning wood, nutshells, animal bones, and other carbonaceous materials. Charcoal becomes activated by heating it with steam to 800-900°C. During this treatment, a porous, submicroscopic internal structure is formed which gives it an extensive internal surface area. Activated charcoal is commonly used as a gas or vapor adsorbent in air-purifying respirators and as a solid sorbent in air sampling.

Acute Effect. Adverse effect on a human or animal which has severe symptoms developing rapidly and coming quickly to a crisis. Also see "chronic effect."

Affected Employee. An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is performed.

AIHA. American Industrial Hygiene Association.

Air. The mixture of gases that surrounds the earth its major components are as follows: 78.08% nitrogen, 20.95% oxygen, 0.03% carbon dioxide, and 0.93% argon. Water vapor (humidity) varies.

Air-line respirator. A respirator that is connected to a compressed breathing air source by a hose of small inside diameter. The air is delivered continuously or intermittently in a sufficient volume to meet the wearer's breathing requirements.

Attendant. An individual stationed outside one or more permit spaces who monitors the authorized entrants. This individual also performs all *attendant's* duties assigned in the CAWCD Confined Space Entry Program.

Authorized Employee. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this program.

Authorized Entrant. An employee who is authorized by the CAWCD to enter a permit space.

Back Up O & M Supervisor. The backup O & M Supervisor will perform the duties of the O & M Supervisor during his absence.

Benign. Not malignant. A benign tumor is one which does not metastasize or invade tissue. Benign tumors may still be lethal, due to pressure on vital organs.

Biohazard. A combination of the words biological and hazard. Organisms or products of organisms that present a risk to humans.

Blanking or Blinding The absolute closing of a pipe, line, or duct by the fastening of a solid plate (i.e., a spectacle blind or a skillet blind) completely covering the bore and capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Blue Lock. Is an individually keyed lock used for personal protection while an employee is working under a Clearance, Group Lockout or Single Lockout.

Boiling point. The temperature at which the vapor pressure of a liquid equals atmospheric pressure.

Capable of Being Locked Out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy-isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Carbon monoxide. A colorless, odorless toxic gas produced by any process that involves the incomplete combustion of carbon-containing substances. It is emitted through the exhaust of gasoline-powered vehicles.

Carcinogen. A chemical is considered to be a carcinogen if:

a. It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen.

b. It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition).

c. It is regulated by OSHA as a carcinogen.

CAS. Chemical Abstracts Service is an organization under the American Chemical Society. CAS abstracts and indexes chemical literature from all over the world in "Chemical Abstracts." "CAS Numbers" are used to identify specific chemicals or mixtures.

Ceiling Limit (C). An airborne concentration of a toxic substance in the work environment, which should never be exceeded.

CERCLA. Comprehensive Environmental Response, Compensation and Liability Act of 1980. Commonly known as "Superfund." (U.S.EPA)

CFR. Code of Federal Regulations. A collection of the regulations that have been promulgated under United States law.

Chemical Cartridge Respirator. A respirator that uses various chemical substances to purify inhaled air of certain gases and vapors. This type respirator is effective for concentrations no more than ten times the TLV of the contaminant, if the contaminant has warning properties (odor or irritation) below the TLV.

CHEMTREC. Chemical Transportation Emergency Center. Public service of the Chemical Manufacturers Association that provides immediate advice for those at the scene of hazardous material emergencies. CHEMTREC has a 24-hour toll- free telephone number (800-424-9300) to help respond to chemical transportation emergencies. **Only the Safety Department or ECD should contact CHEMTREC.**

Chronic Effect. An adverse effect on a human or animal body, with symptoms which develop slowly over a long period of time or which recur frequently. Also see “acute.”

Clearance. A Clearance is a statement with documentation from the O & M Supervisor, Clearance Coordinator or the Clearance Coordinator’s authorized representative to the Clearance Holder stating that the equipment to be worked on has been de-energized and isolated from all listed hazardous energy sources and effectively places the equipment out of service.

Clearance Coordinator. The Clearance Coordinator is the CAWCD employee who has been designated to administer the CAWCD Hazardous Energy Control Program.

Clearance Holder. Is a person authorized to request, receive and release Clearances and who assumes responsibility and/or a lead role on a job.

Combustible Liquid. Combustible liquids are those having a flash point at or above 37.8C (100F).

Commerce. The term "commerce" means trade, traffic, commerce, or transportation within the jurisdiction of the United States.

Commercial Drivers' License Regulation Applicability. The rules in this part apply to every person who operates a commercial motor vehicle in interstate, foreign, or intrastate commerce and to all employees of such persons.

Commercial Motor Vehicle. A commercial motor vehicle means a motor vehicle or combination of motor vehicles used in commerce to transport persons or property if that motor vehicle:
Has a gross combination weight rating of 26,001 or more pounds including a towed unit with a gross vehicle weight rating of more than 10,000 pounds.
Has a gross vehicle weight rating of 26,001 or more pounds.
Is designed to transport 16 or more passengers including the driver.
Is of any size and is used to transport any quantity of hazardous material which require **placarding**.

Concentration. The amount of a given substance in a stated unit of measure. Common methods of stating concentration are percent by weight or by volume, weight per unit volume, normality, etc.

Contractor Definition. "Contractor" refers to Non-CAWCD construction forces.

Corrosive. A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the point of contact.

Cutaneous. Pertaining to or affecting the skin.

Degrees Celsius (Centigrade). The temperature on a scale in which the freezing point of water is 0 °C and the boiling point is 100 °C. To convert to degrees Fahrenheit, use the following formula: °F = (°C x 1.8) + 32.

Degree Fahrenheit. The temperature on a scale in which the boiling point of water is 212° F and the freezing point is 32° F.

Density. The mass per unit volume of a substance. For example, lead is much more dense than aluminum.

Dermatosis. A broader term than dermatitis; it includes any cutaneous abnormality,

thus encompassing folliculitis, acne, pigmentary changes, and nodules and tumors.

DOL. U.S. Department of Labor. OSHA and MSHA are part of the DOL.

DOT. U.S. Department of Transportation.

Dose-response relationship. Correlation between the amount of exposure to an agent or toxic chemical and the resulting effect on the body.

Double Block and Bleed The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves, and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Dusts. Solid particles generated by handling, crushing, grinding, rapid impact, detonation, and decrepitation of organic or inorganic materials, such as rock, ore, metal, coal, wood and grain. Dusts do not tend to flocculate, except under electrostatic forces; they do not diffuse in air but settle under the influence of gravity.

Dyspnea. Shortness of breath, difficult or labored breathing.

Emergency. Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Employee in Charge. Is an individual responsible for a job. He/She is also the site representative for a group of employees performing similar work on the same job. The person is normally the on site contact person.

Energized. Connected to an energy source or containing residual or stored energy.

Energy Isolating Device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors. No poles can be operated independently on a multi-phase disconnect.

Energy isolating device may also be a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not to used as energy isolating devices.

Energy Source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Engulfment. The surrounding and effective capture of a person by a liquid or finely

divided (flowable) solid substance. This substance can be aspirated to cause death by filling or plugging the respiratory system, or can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry Permit. The written or printed document provided by CAWCD to allow and control entry into a permit space.

EPA. U.S. Environmental Protection Agency.

Evaporation. The process by which a liquid is changed into the vapor state.

Evaporation Rate. The ratio of the time required to evaporate a measured volume of a liquid to the time required to evaporate the same volume of a reference liquid (butyl acetate, ethyl ether) under ideal test conditions. The higher the ratio, the slower the evaporation rate. The evaporation rate can be useful in evaluating the health and fire hazards of a material.

Federal Register. Publication of U.S. government documents officially promulgated under the law, documents whose validity depends upon such publication. It is published on each day following a government working day. It is, in effect, the daily supplement to the Code of Federal Regulations, CFR.

Fire point. The temperature at which a substance such as lubricating oil, will give off a vapor that will burn continuously after ignition.

First Aid. Emergency measures administered to person before regular medical help can be obtained.

Flammable limits. Flammables have a minimum concentration below which propagation of flame does not occur on contact with a source of ignition. This is known as the lower flammable explosive limit (LEL). There is also a maximum concentration of vapor or gas in air above which propagation of flame does not occur. This is known as the upper flammable explosive limit (UEL). These units are expressed in percent of gas or vapor in air by volume.

Flammable Liquid. Any liquid having a flash point below 37.8°C (100°F), except any mixture having components with flashpoints of 100°F or higher, the total of which make up 99 percent or more of the total volume of the mixture.

Flammable Range. The difference between the lower and upper flammable limits, expressed in terms of percentage of vapor or gas in air by volume, and is also often referred to as the "explosive range."

Flash Point. The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface

of the liquid. Two tests are used - open cup and closed cup.

Fume. Airborne particulate formed by the evaporation of solid materials, e.g., metal fumes emitted during welding. Usually less than one micron in diameter.

Gage pressure. Pressure measured with respect to atmospheric pressure.

Gas. A state of matter in which the material has very low density and viscosity; can expand and contract greatly in response to changes in temperature and pressure; easily diffuses into other gases; readily and uniformly distributes itself throughout any container. A gas can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Examples include sulfur dioxide, ozone, and carbon monoxide.

Gram (g). A metric unit of weight. One ounce equals 28.4 grams.

Gold Lock. A Gold Lock is used for an Out of Service or Special Condition to protect equipment. The lock is used to provide a physical restraint to an energy control device. The lock must be accompanied by an Out of Service or Special Condition Tag that states the reason for the Out of Service or Special Condition. **Gold Locks will not under any circumstances be used to protect employees!**

Group Lock Box. Is a Lockbox that contains all the keys for Red locks used to provide control of energy isolating devices under a Group Lockout or a Clearance.

Group Lockout . Is a procedure used to control energy isolating devices having multiple lockout points. Energy isolating devices are locked out with a Red Lock.

Hazardous Atmosphere An atmosphere that may expose an employee to the following:

1. Risk of death

2. Incapacitation

3. Impairment or ability to self-rescue (that is an unaided escape from a permit space)

4. Acute illness from one or more of the following causes:

    a. Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL)

    b. Airborne combustible dust at a concentration that meets or exceeds its lower flammable limit (LFL)

c. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent

d. Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in OSHA 29 CFR 1910 sub-part G, Occupational Health and Environmental Control, or in OSHA 29 CFR 1910 Sub-part Z, Toxic and Hazardous Substances, which could result in employee exposure in excess of its dose or permissible exposure limit

e. Any other atmospheric condition immediately dangerous to life or health

NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, OSHA 29 C.F.R. §1910.1200, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

HAZMAT Employee. A person who is employed by a HAZMAT employer and who, in the course of employment, directly affects hazardous material transportation safety. This term includes an individual, including a self-employed individual, employed by a HAZMAT employer who, in the course of employment:

a. Loads, unloads, or handles hazardous material.

b. Manufactures, tests, reconditions, or repairs, modifies, marks, or otherwise represents containers, drums, or packages as qualified for use in the transportation of hazardous material.

c. Prepares hazardous material for transportation.

d. Is responsible for safety of transporting hazardous material.

e. Operates a vehicle used to transport hazardous material.

HAZMAT Employer. A company that uses one or more of its employees in connection with:

a. Transporting hazardous material in commerce.

b. Causing hazardous material to be transported or shipped in commerce.

c. Representing, marking, certifying, selling, offering, manufacturing, reconditioning, testing, repairing, or modifying containers, drums.

d. Packaging as qualified in the transportation of hazardous material.

HECP. Central Arizona Water Conservation District Hazardous Energy Control Program

HEPA filter. (High Efficiency Particulate Air Filter) A disposable, extended medium, dry type filter with a particle removal efficiency of not less than 99.97 percent for 0.3pm particles.

Highly Toxic. A chemical falling within any of the following categories:

a. A chemical that has a median lethal dose (LD50) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

b. A chemical that has a median lethal dose (LD50) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits between 2 and 3 kilograms each.

c. A chemical that has a median lethal concentration (LC50) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams ea.

Hot Work Permit. CAWCD's written authorization to perform operations (i.e., brazing, drilling, grinding, welding, cutting, burning, and heating) capable of providing a source of ignition.

IARC. International Agency for Research on Cancer.

IDLH. Immediately Dangerous to Life and Health. An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

Ignition Source. Anything that provides heat, spark or flame sufficient to cause combustion/explosion.

Ignition Temperature. The minimum temperature to initiate or cause self- sustained combustion in the absence of any source of ignition.

Impervious. A material that does not allow another substance to pass through or penetrate it. Frequently used to describe gloves.

Inches of Mercury Column. A unit used in measuring pressures. One inch of mercury column equals a pressure of 1.66 kPa (0.491 psi).

Inches of Water Column. A unit used in measuring pressures. One inch of water column equals a pressure of 0.25 kPa (0.036 psi).

Incompatible. Material which could cause dangerous reactions from direct contact with one another.

Ingestion. Taking in by the mouth.

Inhalation. Breathing of a substance in the form of a gas, vapor, fume, mist, or dust.

Insoluble. Incapable of being dissolved in a liquid.

Irritant. A chemical which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of 16 CFR 1500.41 for four hours exposure or by other appropriate techniques, it results in an empirical score of five or more. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

Lockout. The placement of a lock on an energy-isolating device, in accordance with an established procedure. This ensures that the energy-isolating device and the equipment being controlled cannot be operated.

Lockout Device. A device that utilizes a positive means such as a lock, to hold an energy-isolating device in a safe position and prevent the energizing of a machine or equipment. Included are valve pins, blank flanges and bolted slip blinds.

LO/TO. Is an acronym for lockout/tag-out.

Latent Period. The time that elapses between exposure and the first manifestation of damage.

LC50. Lethal concentration that will kill 50 percent of the test animals within a specified time. See LD50.

LD50. The dose required to produce the death in 50 percent of the exposed species

within a specified time.

Liter (L). A measure of capacity - one quart equals O.9L.

Lower explosive limit (LEL). The lower limit of flammability of a gas or a vapor at ordinary ambient temperatures expressed in percent of the gas or vapor in air by volume. This limit is assumed constant for temperatures up to 120°C (250°F). Above this, it should be decreased by a factor of 0.7 because explosiveness increases with higher temperatures.

Malignant. As applied to a tumor. Cancerous and capable of undergoing metastasis, or invasion of surrounding tissue.

Materials of Trade. Materials of Trade means a hazardous material, other than a hazardous waste, that is carried on a motor vehicle:

a. For the purpose of protecting the health and safety of the motor vehicle operator or passengers.

b. For the purpose of supporting the operation of a motor vehicle (including its auxiliary equipment).

c. By a private motor carrier (including vehicles operated by a rail carrier) in direct support of a principal business other than transportation by a motor vehicle.

Metastasis. Transfer of the causal agent (cell or microorganism) of a disease from a primary focus to a distant one through the blood or lymphatic vessels. Also, spread of malignancy from site of primary cancer to secondary sites.

Meter. A metric unit of length, equal to about 39 inches.

Micron (micrometer, 1lm). A unit of length equal to one millionth of a meter, approximately 1/25,000 of an inch.

Milligram (mg). A unit of weight in the metric system. One thousand milligrams equals one gram.

Milligrams per cubic meter (MgM^3). Unit used to measure air concentrations of dusts, gases, mists, and fumes.

Milliliter (mL). A metric unit used to measure volume. One milliliter equals one cubic centimeter.

Millimeter of mercury (mmHg). The unit of pressure equal to the pressure exerted by a column of liquid mercury one millimeter high at a standard temperature.

Mists. Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, or atomizing. Mist is formed when a finely divided liquid is suspended in air.

MSDS. Material Safety Data Sheet.

MSHA. Mine Safety and Health Administration, U.S. Department of Labor.

Mucous Membranes. Lining of the hollow organs of the body, notably the nose, mouth, stomach, intestines, bronchial tubes, and urinary tract.

NFPA. The National Fire Protection Association is a voluntary membership organization whose aim is to promote and improve fire protection and prevention. The NFPA publishes 16 volumes of codes known as the National Fire Codes.

NIOSH. The National Institute for Occupational Safety and Health is a federal agency. It conducts research on health and safety concerns, tests and certifies respirators, and trains occupational health and safety professionals.

NTP. National Toxicology Program. The NTP publishes an annual report on carcinogens.

Non-Resident Definition. "Non-Resident CAWCD Personnel" referred to in this section means personnel who are centralized and perform work at several CAWCD facilities. In the normal course of their duties they do not report to one facility on a routine basis.

Normal Production Operations . The utilization of a machine or equipment to perform its intended production function.

O&M Supervisor. The O & M Supervisors are responsible for preparing or approving a correct Clearance Switching Procedure Form and directing switching and related operations.
Each O & M Supervisor may delegate the responsibility for preparation and placement of Clearances to the Backup O & M Supervisor.
The O&M Supervisor may be authorized to direct the switching and other operations required in placing and removing the protection for Clearances, Out of Service, Special Conditions.

Out of Service. The Out-of-Service is a documented isolation that may be placed on a system or piece of equipment when the task that workers are to perform on or near that equipment would not adversely affect its availability and no hazardous condition is created by working on or near the equipment. **Gold Locks will not under**

any circumstances be used to protect employees!

PPM. Parts per million, parts of air by volume of vapor or gas or other contaminant used to measure air concentrations of vapors and gases.

PSI. Pounds per square inch (for MSDS purposes) is the pressure a material exerts on the walls of a confining vessel or enclosure. For technical accuracy, pressure must be expressed as psig (pounds per square inch gauge) or psia (pounds per square absolute; that is, gauge pressure plus sea level atmospheric pressure, or psig plus approximately 14.7 pounds per square inch).

RCRA. Resource Conservation and Recovery Act of 1976. (U.S.EPA)

Reactivity (chemical). A substance's susceptibility to undergo a chemical reaction or change that may result in dangerous side effects, such as an explosion, burning, and corrosive or toxic emissions.

Red Lock. Is a lock in keyed-alike sets used to secure multiple energy isolating devices used on a Group Lockout or Clearance.

Respirable Size Particulates. Particulates in the size range that permits them to penetrate deep into the lungs upon inhalation.

Respirator (approved). A device which has met the requirements of 29 CFR and is designed to protect the wearer from inhalation of harmful atmospheres and has been approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA).

Respiratory System. Consists of (in descending order) - the nose, mouth, nasal passages, nasal pharynx, pharynx, larynx, trachea, bronchi, bronchioles, air sacs (alveoli) of the lungs, and muscles of respiration.

Route of Entry. The path by which chemicals can enter the body. There are three main routes of entry: inhalation, ingestion, and skin absorption.

SARA. Superfund Amendments and Reauthorization Act of 1986. (U.S.EPA)

SCBA. Self-contained breathing apparatus.

Safety Sensitive. A position designated as where 25% or more of the positions normal work hours require the use of appropriate PPP and/or requiring specialized safety training to prevent injury or illness. These positions normally work in close proximity to the pumping plants, aqueduct, checks and related structures, siphons, or with any industrial machinery / vehicles and /or tools required to maintain the Central Arizona Project (The current listing of "safety sensitive" positions is available in

Appendix B of the Return to work policy).

Sensitizer. A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

Stability. An expression of the ability of a material to remain unchanged. For MSDS purposes, a material is stable if it remains in the same form under expected and reasonable conditions of storage or use. Conditions which may cause instability (dangerous change) are stated. Examples are temperatures above 150°F, and shock from dropping.

Synergism. Cooperative action of substances whose total effect is greater than the sum of their separate effects.

Systemic. Spread throughout the body, affecting all body systems and organs, not localized in one spot or area.

Servicing and/or Maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment, and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.

Setting Up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Special Work Permit. A Special Work Permit is a statement that formalizes and documents the preparation and coordination between CAWCD and Non- Resident CAWCD or Outside Contractor personnel to authorize work by these entities on or near CAWCD facilities.

Special Condition. The Special Condition procedure is to provide temporary special operating or limiting instructions for power or auxiliary equipment. Although a Special Condition may serve as temporary protection for equipment, **IT SHALL NEVER BE USED FOR PROTECTION OF PERSONNEL.**

Switchman. A Switchman as defined in this section means a CAWCD electrician who has been certified and authorized to perform Electrical Power System switching on energized systems or devices operating above 480 volts AC.

Tag-out. The placement of a tag on an energy-isolating device, in accordance with an established procedure, to indicate that the energy-isolating device and the equipment being controlled may not be operated until the tag is removed.

Threshold. The lowest dose or exposure to a chemical at which a specific effect is observed.

Time-weighted average concentration (TWA). Refers to concentrations of airborne toxic material which have been weighted for a certain time duration, usually 8 hours.

TLV. Threshold Limit Value. A time-weighted average concentration under which most people can work consistently for 8 hours a day, day after day, with no harmful effects. The American Conference of Governmental Industrial Hygienists publishes a table of these values and accompanying precautions annually.

Toxic. A chemical falling within any of the following categories:

a. Chemical that has a median lethal dose (LD50) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

b. A chemical that has a median lethal dose (LD50) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

c. A chemical that has a median lethal concentration (LC50) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 100 grams each.

Toxicity. A relative property of a chemical agent and refers to a harmful effect on some biologic mechanism and the conditions under which this effect occurs.

Target organ effects. The following is a target organ categorization of effects which may occur, including examples of signs and symptoms of chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be aII-inclusive:

a. **Hatotoxins** Chemicals which produce liver damage Signs & Symptoms: Jaundice; liver enlargement Chemicals: Carbon tetrachloride; nitrosamines

b. **Nephrotoxins:** Chemicals which produce kidney damage Signs & Symptoms: Edems; proteinuria
Chemicals: Halogenated hydrocarbons; uranium

c. **Neurotoxins:** Chemicals which produce their primary toxic effects on the

nervous system
Symptoms: Narcosis; behavioral changes; decrease in motor functions
Chemicals: Mercury; carbon disulfide

d. **Agents which act on the blood or hematopoietic system:** Decrease hemoglobin function; deprive the body tissues of oxygen Signs & Symptoms: Cyanosis; loss of consciousness
Chemicals: Carbon monoxide; cyanides

e. **Agents which damage the lung:** Chemicals which irritate or damage the pulmonary tissue
Signs & Symptoms: Cough; tightness in chest; shortness of breath
Chemicals: Silica; asbestos

f. **Reproductive toxins:** Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis)
Signs & Symptoms: Birth defects; sterility Chemicals: Lead; DBCP

g. **Cutaneous hazards:** Chemicals which affect the dermal layer of the body, Signs & Symptoms: Defatting of the skin; rashes; irritation Chemicals: Ketones; chlorinated compounds

h. **Eye hazards:** Chemicals which affect the eye or visual capacity Signs & Symptoms: Conjunctivitis; corneal damage
Chemicals: Organic solvents; acids

TCA. Trichloroethane, used extensively in solvents. Can cause central nervous system and cardiovascular depression.

TCE. Trichloroethylene, an industrial solvent. Can lead to cardiotoxicity and neurological impairment with exposure to high concentration.

Upper explosive limit (UEL). The highest concentration (expressed in percent vapor or gas in the air by volume) of a substance that will burn or explode when an ignition source is present.

Vapor pressure. Pressure (measured in pounds per square inch absolute - psia) exerted by a vapor. If a vapor is kept in confinement over its liquid so that the vapor can accumulate above the liquid (the temperature being held constant), the vapor pressure approaches a fixed limit called the maximum (or saturated) vapor pressure, dependent only on the temperature and the liquid.

Vapors. The gaseous form of substances that are normally in the solid or liquid state (at room temperature and pressure). The vapor can be changed back to the solid or liquid state either by increasing the pressure or decreasing the temperature alone.

Vapors also diffuse. Evaporation is the process by which a liquid is changed into the vapor state and mixed with the surrounding air.

Solvents with low boiling points will volatilize readily. Examples include benzene, methyl alcohol, mercury, and toluene.

Viscosity. The property of a fluid that resists internal flow by releasing counteracting forces.

Volatility. The tendency or ability of a liquid to vaporize. Such liquids as alcohol and gasoline, because of their well-known tendency to evaporate rapidly, are called volatile liquids.

Water Column. A unit used in measuring pressure. See also inches of water column.

WATER SYSTEMS OPERATOR. On Major equipment the Water Systems Operator (WSO) is responsible for ISSUING and accepting the RELEASE of Clearances using pre-approved Clearance Switching procedure forms on Major equipment. The WSO issuing the Clearance is responsible for correctness of the documentation of the switching activities.

ZERO-ENERGY STATE. A condition that is reached when all energy sources to or within equipment are isolated, blocked, or otherwise relieved, with no possibility of re-accumulation. Equipment is not safe to work on until it is in a zero-energy state.

(Main TOC)

CENTRAL ARIZONA PROJECT
SAFETY & HEALTH DEPARTMENT

ASBESTOS OPERATIONS and

MAINTENANCE PROGRAM

NOVEMBER 23, 2009

CENTRAL ARIZONA PROJECT
ASBESTOS O&M PROGRAM

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1.0 PROGRAM DESCRIPTION

This Asbestos Operations and Maintenance (O&M) Program is designed to minimize and eventually eliminate asbestos containing materials (ACM) at Central Arizona Water Conservation District (CAWCD) facilities. This Operations and Maintenance will also reduce the potential for exposures to asbestos fibers until ACM is removed from existing facilities. This Program will remain in effect until all asbestos containing materials have been completely eliminated from all CAWCD facilities and properties (including, but not limited to, motor vehicles, overhead cranes, elevators, turnout gates, and portable equipment).

2.0 SCOPE

This O&M Program is designed to identify ACM at CAWCD facilities, minimize the possibility of accidental disturbance of asbestos-containing materials, provide direction on dealing with ACM in CAWCD facilities, and to protect CAWCD employees who must work around these materials.

The Program includes the following items:

- A written plan for identifying and maintaining ACM,
- A warning and notification system,
- A periodic, routine in-house monitoring or inspection system,
- A work control/permit system to control activities that might disturb ACM,
- A provision for training all employees who will, or may, come in contact with the materials and, if necessary,
    - A medical screening program for asbestos workers and supervisors who work with ACM during maintenance activities, and,
    - A written respirator program per 29 CFR 1926.134 for employees who wear a respirator, and,
- A thorough documentation and recordkeeping system.

This O&M Program follows a systematic approach to document CAWCD's actions for addressing ACM materials and to provide an inter-disciplinary approach to the protection of the CAWCD employees. Therefore, technical

assistance and recommendations are obtained from relevant parties including the Safety and Health Department, Legal Department, Environmental Compliance, Maintenance, Headquarters Maintenance (including maintenance and custodial personnel), Engineering Administration, and our medical services provider.

3.0 DEFINITIONS

Abatement means the scheduled removal of Asbestos Containing Material (ACM) or Presumed Asbestos Containing Materials (PACM) by qualified professionals for the purpose of eliminating the asbestos from CAWCD facilities.

Accredited Inspectors: A CAWCD employee who has completed the Asbestos Hazard Emergency Response Act (AHERA) training courses for Building Inspector and/or Management Planner. (This would include designated personnel within the Safety and Health Dept.)

ACM means any material (gaskets, co-plastic gates, textured drywall, vinyl floor tiles, etc.) containing more than 1% asbestos.

AHERA means the Asbestos Hazard Emergency Response Act. EPA regulations implemented in 1987 which govern asbestos in public and private schools, K through 12, throughout the United States. The AHERA regulations have become the "industry standard" for protecting building occupants from exposures to asbestos and compliance with significant portions of this regulation are implicated for CAWCD.

Amended water means water to which a surfactant (wetting agent) has been added to increase the ability of the water to penetrate ACM material and coat asbestos fibers.

Asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite, and any of these minerals that has been chemically treated and/or altered. For purposes of these definitions, "asbestos" also includes PACM, as defined below. Other types of asbestos minerals exist, but only the six listed above are regulated by OSHA and EPA.

Asbestos-containing material (ACM), means any material containing more than one percent asbestos when analyzed using polarized light microscopy (PLM).

Asbestos Coordinator means the person that exercises control over CAWCD's Asbestos O&M Program. This person is designated as the Senior Industrial Hygienist with the Safety and Health Department.

Authorized person means any person authorized by the employer and required by work duties to be present inside an asbestos regulated area.

Class I asbestos work means activities involving the removal (abatement) of Thermal System Insulation (TSI) and surfacing ACM and PACM.

Class II asbestos work means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting (linoleum), roofing and siding shingles, construction mastics, and adhesives.

Class III asbestos work means repair and maintenance operations, where "ACM", including TSI and surfacing ACM and PACM, is likely to be disturbed.

Class IV asbestos work means maintenance and custodial activities during which employees contact <u>but do not disturb</u> ACM or PACM and also includes activities to clean up dust, waste, and debris resulting from any Class I, II, and III activities.

Clean room means an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials, supplies, tools, and equipment.

Competent person means, as defined in EPA regulation 29 CFR 32 (f), “one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure” and “who has the authority to take prompt corrective measures to eliminate them.”

As specified in OSHA for Class I and Class II work, “one who is specifically trained (AHERA Contractor/Supervisor) in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor, or its equivalent” and, for Class III and Class IV work, “one who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2)”.

Critical barrier means one or more layers of 6 mil plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.

Disturbance means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM, no greater than the amount that can be contained in one standard sized waste bag or glovebag, which shall not exceed 60 inches by 60 inches in size.

Encapsulation means having ACM coated with a penetrating or bridging sealant to prevent release of asbestos fibers into the air.

Enclosure means having ACM physically separated from the building environment by means of erecting a permanent airtight barrier around the ACM.

Employee exposure means that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

Fiber means a particulate form of asbestos which is 5 micrometers or longer in length, with a length-to-diameter ratio of 3 to 1 or greater.

Friable means ACM that, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure alone.

Glovebag means not more than a 60 x 60 inch impervious plastic bag-like enclosure, generally 6-mil or thicker, affixed around an asbestos containing material, with glove-like appendages through which material and tools may be handled.

High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter or larger.

Intact means that the ACM has not crumbled, been pulverized, or otherwise deteriorated and that the asbestos fibers are still bound with its initial matrix.

Negative Initial Exposure Assessment means a demonstration by the employer, which complies with the criteria in OSHA regulations 29 CFR 1926.1101, paragraph (f)(2)(iii). This indicates that employee exposures during a specific asbestos operation are expected to be consistently below the OSHA PELs.

Non-friable means a material, usually ACM, which, when dry, may not be crumbled, pulverized, or reduced to powder by hand pressure.

Operations and Maintenance Program (O&M) means a written program with specific procedures and practices developed for the interim control of asbestos containing materials in buildings until they are removed.

Permissible Exposure Limit (PEL) means the airborne concentration of fibers, above which, all components of the OSHA regulations become enforceable. This concentration is set at 0.1 fibers per cubic centimeter of air (f/cc) which is equivalent to 100,000 fibers per cubic meter of air. This Time Weighted Average PEL is set for an 8-hour exposure period. This concentration is NOT a health based level. It is a level, above which, all the OSHA requirements are enforceable. A second PEL (Excursion Level) is set at 1 f/cc during any 30 minute period of the workday. This exposure is determined, independent of the 8-hour TWA PEL and is enforceable during any 30 minutes of a full work shift.

Presumed Asbestos Containing Material (PACM) means insulation on thermal systems and surfacing material found in buildings constructed no later than 1980. The designation of a material as "PACM" may be rebutted using the criteria listed in OSHA regulations 1926.1101, paragraph (k)(5). That is, the material is sampled by a qualified person and laboratory results prove that the material does not contain asbestos.

Regulated area means an area established by the employer to demarcate where Class I, II, and/or III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed, the Permissible Exposure Limit. Requirements for regulated areas are set out in paragraph (e) of the OSHA regulations, 29 CFR 1926.1101.

Removal means to have ACM and/or PACM removed from CAWCD facilities by qualified professionals and disposed of in accordance with OSHA and EPA regulations.

Renovation means the modifying of any existing structure, or portion thereof, including construction, alteration, and/or repair, including painting and decorating. For NESHAP compliance, “Renovation” is removing threshold amounts of RACM.

Repair means overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Response Action means an activity, conducted by properly trained and equipped personnel to repair, renovate, encapsulate, enclose, or remove, identified ACM or suspect PACM in accordance with OSHA and EPA regulations. This activity involves any sized area of ACM or PACM.

Surfacing material means material that is sprayed, troweled-on or otherwise applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).

Thermal system insulation (TSI) means ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other mechanical components to prevent heat loss or gain.

4.0 PROGRAM RESPONSIBILITIES

4.1 The Asbestos Coordinator will implement this Asbestos Operations and Maintenance Program. Duties will include:

4.1.1 Documenting, updating, publicizing, and disseminating this Asbestos Operations and Maintenance Program.

4.1.2 Developing and maintaining the documented inventory of asbestos-containing materials, their locations, conditions, and quantities.

4.1.3 Managing asbestos inspections, bulk sampling surveys, maintenance work impacting ACM, renovation work impacting ACM, ACM abatement plans, air sampling surveys, and final clearance assessments.

4.1.4 Participating in the development, review, and monitoring of program designs, and/or repair and renovation projects to ensure compliance with applicable standards and regulations when ACM might be disturbed.

4.1.5 Overseeing asbestos training of CAWCD workers, supervisors, and building inspectors in compliance with the Environmental Protection Agency's (EPAs) Model Accreditation Program.

4.1.6 Overseeing a medical surveillance program and written respirator program for CAWCD employees with potential exposure to asbestos materials during renovation and remodeling work.

4.1.7 Responsibility for recordkeeping including maintaining and updating CAWCD's Asbestos Operations and Maintenance Plan, the database of ACM locations, employee training records, and the employee medical surveillance records.

4.1.8 Ensuring that recommended procedures and safety precautions are followed before authorizing construction and maintenance work which could disturb ACM at or in CAWCD properties or facilities.

4.2 Engineering Administration – The duties will include:

- Prior planning with the Asbestos Coordinator on all construction and renovation activities. This includes advanced notification to the Safety and Health Department on any construction or renovation activities to verify the presence or absence of ACM in facilities and/or structures to be impacted by the construction work.

4.3 Headquarters Maintenance – The duties will include:

- Prior planning with the Asbestos Coordinator on all construction, renovation, remodeling, maintenance, or equipment repair work. This includes advanced notification

to the Safety and Health Department on any construction or renovation activities to verify the presence or absence of ACM in facilities and/or structures to be impacted by the remodeling or maintenance work.

4.4 Centralized Maintenance and Pumping Plants – The duties should include:

- Prior planning with the Asbestos Coordinator on all construction, renovation, maintenance, or equipment repair work which could impact ACM.
- Informing the Asbestos Coordinator when damage to ACM or PACM is observed or when debris must be cleaned up.
- Avoiding patch or repair of any damaged ACM or PACM until the Asbestos Coordinator has assessed the material.

5.0 Specific Program Components

5.1 WARNINGS AND NOTIFICATION

All employees at CAWCD are notified of ACM through the New Employee Orientation training provided by the Safety and Health Department. In addition, all employees who could come in direct contact with ACM or PACM during their work activities (custodial, janitorial, maintenance workers, etc.) must complete CAP's 2-Hour Asbestos Awareness training. Training records are available though the Safety and Health Department Training Administrator.

In addition, many asbestos containing materials have been identified and removed by trained work crews in the past and rebuilt with Non-ACM replacement materials. In those cases, the new material has been labeled as "Non-ACM" on an adjoined surface. This specifically includes gasket materials in the pumping plants.

Unidentified materials can be surveyed and/or sampled by contacting the Safety and Health Department's Designated Personnel who will properly collect representative samples of the material in question. These samples will be taken to an accredited laboratory for analysis. Sample results can sometimes be available within 24 hours of notification. See Attachment A for a listing of Asbestos Contacts.

A comprehensive inventory of asbestos containing materials at CAWCD is being completed. There are approximately 127 structures which could contain ACM, including all the pumping

plants, check structures, microwave control buildings, and Headquarters buildings. See Attachment B for a partial listing of ACM types at CAWCD.

5.2 ASBESTOS INSPECTIONS AND AIR MONITORING

Inspection of all suspect ACM or PACM will be conducted by the Asbestos Coordinator or a person appointed by the Coordinator who must be AHERA-certified as a Building Inspector. Samples CAN NOT be collected by untrained personnel. Sample collection by non-certified samplers is a violation of both OSHA and EPA regulations and sample results are not legal. In addition it increases the risk of exposure for employees. CAWCD's Asbestos Operations and Maintenance Program prohibits non-certified employees collecting samples for asbestos.

Inspection and sampling will be conducted in general accordance with the guidelines in the AHERA regulations. A minimum of 3, 5, or 7 samples of a suspect material, based on total square or linear footage, will be collected. Homogenous areas will be identified. Summary information on the location, type and quantity of material, condition, potential for damage, and etc. will be collected on a standard form. This form will be developed and maintained by the Asbestos Coordinator. Summary information will be transferred to the asbestos database for compilation.

An air monitoring program will provide useful supplemental information to the inspection program. However, air monitoring is used only to document OSHA compliance and as a supplemental management tool and not as a replacement for the physical and visual inspection of the asbestos material in place.

Air monitoring can only detect asbestos fibers after a release has occurred and therefore, will not serve as an effective preventive measure. In general, air monitoring will be conducted to document breathing zone exposures of Asbestos Workers during renovation or repair work in which ACM is disturbed during the work. Samples will be collected to document a Negative Exposure Assessment. Any asbestos work which could create exposure levels at or above the OSHA Permissible Exposure Limit will not be conducted by CAWCD employees and will be contracted out to qualified outside contractors.

5.3 ASBESTOS REMOVAL AND ABATEMENT

At present, the only ACM to be removed by CAWDC personnel is gasket materials in the pumping plants. Special written operating

procedures have been prepared to outline the steps in removing valves, flanges, fittings, and connections that could contain asbestos gasket materials. These have been identified as Asbestos Procedure for Large Gaskets 7F28 and Asbestos Procedure for Small Gaskets 7F28. Copies of these procedures are included in Attachment C and are available in Livelink, Safety Resource Center.

Other small maintenance operations can be conducted to remove ACM from Project property and include Check Gate brakes, Overhead Crane brakes, and elevator brakes. Other "non-friable" ACM materials can be addressed on a case-by-case basis, in consultation with the Asbestos Coordinator. All other abatement or repair work involving ACM or PACM is to be completed by a qualified asbestos abatement contractor.

Removal of ACM by CAWCD personnel must be by individuals trained and certified as an Asbestos Worker under the training requirements of the EPA's Model Accreditation Program (40 CFR 763 Subpart E, Appendix C). Asbestos Worker training consists of a 4-day classroom training session with annual 8-hour classroom refresher training. To be qualified as an Asbestos Worker, the employee must complete the refresher training on a 12-month cycle. Employees not completing the refresher every 12 months will not be allowed to work with ACM until the training is completed. Employees whose refresher training is more than 12 months out-of-compliance will be required to re-attend the 4-day classroom training session to be qualified as an Asbestos Worker.

Each work group at CAWCD with trained Asbestos Workers (Heavy Overhaul Group, Headquarters Maintenance, Machine Shop Maintenance, etc.) must have a Supervisor who is trained as a Contractor/Supervisor under the training requirements of the EPA's Model Accreditation Program (40 CFR 763 Subpart E, Appendix C). Contractor/Supervisor training consists of a 5-day classroom training session with annual 8-hour classroom refresher training. To be qualified as an Contractor/Supervisor, the Supervisor must complete the refresher training on a 12-month cycle. Supervisors not completing the refresher every 12 months will not be allowed to oversee work operations involving ACM until the training is completed. Supervisors whose refresher training is more than 12 months out-of-compliance will be required to re-attend the 5-day classroom training session to be qualified as a Contractor/Supervisor.

Whenever Engineering Services or Headquarters Maintenance anticipates construction, remodeling, renovation, or repair work that

could impact PACM or ACM, they must notify the Asbestos Coordinator to ensure that all asbestos related issues have been addressed. If the material is PACM, the samples of the material will be collected to document that it does or does not contain asbestos. Impacted materials that DO contain asbestos may require contracting with a qualified asbestos abatement contractor. Since this action will require preparation of a contract for services and may require a 2-week NESHAP notification, additional time must be allotted and planning for the work should involve the Asbestos Coordinator as soon as the project is authorized to proceed.

The Asbestos Coordinator will maintain a listing of a minimum of four qualified asbestos abatement contractors. This listing will be maintained as current as possible using information obtained from regulators and industry professionals/environmental consultants.

6.0 Regulatory Requirements

All work performed on ACM will be in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing asbestos abatement, and any other trade work done in conjunction with asbestos handling, contact, abatement, disturbance, or cleanup.

The most recent editions of any relevant regulation, standard, document, or code will be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirements will apply. Such documents include, but are not limited to, the following:

6.1 U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Title 29 Code of Federal Regulations [enforced in Arizona by the Arizona Division of Occupational Safety and Health (ADOSH)]:

- Part 1926.1101 – Asbestos Construction Standard;
- Part 1910.1001 – Asbestos General Industry Standard;
- Part 1910.134 – Respiratory Protection;
- Subpart E – Personal Protective Equipment, including respiratory protection;
- Part 1910.1200 – Hazard Communication;
- Part 1910.145 – Specifications for Accident Prevention, Signs, and Tags; and
- Part 1910.38 – Emergency Action Plans.

6.2 U.S. Environmental Protection Agency (EPA) National Emissions Standard for Hazardous Air Pollutants (NESHAP) Asbestos Regulation (40 CFR 61, Subparts A and M)

- Subpart A – General Provisions
- Subpart M – National Emission Standard for Asbestos

6.3 U.S. Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA) Asbestos Regulation (40 CFR 763, Subpart E), as applicable.

6.4 Arizona Department of Environmental Quality, Maricopa, Pinal and Pima Counties also enforce local regulations related to the EPA's NESHAP requirements and include notification of disturbance of regulated types and amounts of ACM. CAWCD will ensure compliance with these local regulations during handling, contact, abatement, disturbance, or cleanup of asbestos materials.

6.5 U.S. Department of Interior, Bureau of Reclamation, Reclamation Safety and Health Standards (Section 7.17 – Asbestos).

6.6 Occupational Exposure Limits to asbestos fibers, for CAWCD personnel, will be the Threshold Limit Value® (TLV®), most recent edition, published annually by the American Conference of Governmental Industrial Hygienists (ACGIH).

6.7 Department of Transportation requires labeling and manifesting of more than 1 pound of "Asbestos" (friable ACM waste) on the public roadways (49 CFR 171 and following).

7. Reporting Requirements

When ACM is removed from a facility, a notification to regulatory agencies is required under the EPA's NESHAP regulation. Generally this is made by the asbestos contractor. Notification to affected CAWCD personnel is facilitated by the Asbestos Coordinator. All notifications will be performed in strict accordance with all applicable federal, state, and local regulations, standards, and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement.

The most recent editions of any relevant regulation, standard, document, or code will be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirements will apply.

Such documents include, but are not limited to, those listed in section 6.0.

8. Information and External References

8.1 Recordkeeping

The originals of all documents pertaining to this O&M Plan will be kept on file with the Asbestos Coordinator, Safety and Health Department. The standard documents to be kept on file will be:

- CAWCD O&M Plan – Original,
- Reports of building surveys and laboratory analyses (Original Laboratory Reports),
- Record of asbestos disturbances undertaken during renovation and repair work at pumping plants,
- Air sampling surveys to document employee exposures assessments and area fiber concentrations,
- NESHAP notifications,
- Disposal records or waste manifests.

9. Training Requirements

Generally, the Safety and Health Department is responsible for asbestos training for CAWCD employees. Several types of training programs are available and include the following.

1. Asbestos training conducted off-site by The Asbestos Institute includes EPA required training classes. These classes include Asbestos Worker, Contractor/Supervisor, and Building Inspector as defined by the EPA Model Accreditation Program (MAP) for the Asbestos Hazard Emergency Response Act (AHERA). These training classes meet the required training for compliance with the OSHA 1910 and 1926 asbestos standards.

2. Asbestos training conducted on-site by Safety and Health Department staff includes the 2-hour Asbestos Awareness training and new employee orientation overview of asbestos at CAWCD. These two classes include information on the following items:
   - General information regarding asbestos and it's various uses and forms within CAWCD;
   - Information on the known health effects association with asbestos exposures;
   - Locations of Asbestos Containing Materials (ACM) identified throughout each building in which CAWCD employees work;

- Recognition of damaged, deterioration, and delamination of ACM; and,
- For sampling of suspected ACM material, contact John Butler or Russ Herd in Safety and Health.
- To review the current listing of personnel trained to work with asbestos, see Appendix A.

APPENDIX A

LISTING OF ASBESTOS PERSONNEL

LIVE LINK:

HTTP://GECKO/LIVELINK/LLISAPI.DLL/OPEN/21863804

ATTACHMENT B

TYPES OF ACM AT CAWCD FACILITIES

AS OF: NOVEMBER 23, 2009

Facility	Building Material Type	ACM/PACM
Headquarters, Bldg. 1	Vinyl floor tiles	PACM
Headquarters, Bldg. 1	Textured drywall	PACM
Headquarters, Bldg. 1	2 x 4 ft. ceiling tiles	PACM
Headquarters, Bldg. 1	4" vinyl covebase/mastic	PACM
Headquarters, Bldg. 1	Mechanical room pipe insulation	PACM
Headquarters, Bldg. 2	Vinyl floor tiles	PACM
Headquarters, Bldg. 2	Textured drywall	PACM
Headquarters, Bldg. 2	2 x 4 ft. ceiling tiles	PACM
Headquarters, Bldg. 2	4" vinyl covebase/mastic	PACM
Headquarters, Bldg. 2	Mechanical room pipe insulation	PACM
Pumping Plants (all)	Discharge valve gaskets (black)	PACM
Pumping Plants (all)	Discharge valve gaskets (blue)	Non-ACM
Pumping Plants (all)	HVAC piping gaskets (green)	Non-ACM
Pumping Plants (all)	Water line valves and fittings	PACM
Pumping Plants (all)	Vinyl floor tiles (break rooms)	PACM
Pumping Plants (all)	Vinyl floor tiles (Level 4 Offices)	PACM
Pumping Plants (all)	Vinyl floor tiles (Level 4 Tech Rooms.)	PACM
Pumping Plants (all)	Textured drywall	PACM
Pumping Plants (all)	2 x 4 ft. ceiling tiles	PACM
Pumping Plants (all)	4" vinyl covebase/mastic	PACM
Pumping Plants (all)	Mechanical room pipe insulation	PACM
Pumping Plants (all)	Brake shoes (all cranes & elevators)	PACM
Check Gate (all)	Old radial gate brake pads (pre-1995)	ACM
Hassayampa Outlet Structure	radial gate clutch brake pads	ACM
Little Harquahala Pumping Plant	HVAC Compressor piping gaskets (black)	ACM
Check No. 13 to Check No. 18	radial gate clutch brake pads	ACM

THIS LISTING CURRENT AS OF NOVEMBER 23, 2009

NOTE: TABLE WILL BE EXPANDED AS NEW MATERIALS ARE IDENTIFIED.

ATTACHMENT C

PROCEDURES FOR GASKET REMOVAL

Asbestos Procedures for Small Gaskets
(1 to 24 inch)

Prior to any gasket removal work, the supervisor should contact the Safety & Health Department to verify a current (less than 12 calendar months) Negative Exposure Assessment is available for Small Gasket removal. Under no circumstances may a gasket be ground or wire brushed (wire wheels) from a surface without prior consent, in writing, from the Safety & Health Department. All gaskets shall be treated as Asbestos Containing Material (ACM) unless proven otherwise through appropriate bulk sampling results. All work relating to gasket removal is to be conducted only by individuals who have attended the Asbestos Worker training (32 hours class time – OSHA Class 1 or 2 work). Refresher training for Asbestos Worker must be within the last 12 calendar months prior to commencing work.

Procedures:

1. Place 6 mil polyethylene film (plastic) on the floor or surface below the gasket being removed. The plastic shall extend a minimum of three feet (or as far as practical) in all directions from the gasket to be removed. Secure plastic to floor or surface with vinyl duct tape. Demarcate this “regulated area” with OSHA “Danger” tape to restrict other workers in the area. Asbestos hazard signs must be posted at the limit of the demarcated area. Place 6 mil poly “critical barriers” over all HVAC supply/return vents within 20 feet of this regulated area.
2. Thoroughly wet the gasket with amended water (2 oz of liquid soap per gallon of water) before removing any flange bolts.
3. During the actual gasket removal, respiratory protection must be worn by all workers in the “regulated area”. Respiratory protection will be a minimum half-mask respirator with P-100 particulate cartridges.
4. Remove the flange bolts to expose the gasket.
5. Wet the exposed gasket with amended water.
6. Remove the gasket from the flanged surface. Use of a hand scraper or similar tool to break the gasket from the surface is permitted.

7. Place the gasket in an asbestos waste bag and seal the bag. Ensure the gasket is visibly wet inside the bag (there should be water droplets throughout the inside of the bag).
8. A label stating: "DANGER – CONTAINS ASBESTOS FIBERS – AVOID CREATING DUST – CANCER AND LUNG DISEASE HAZARD" must be placed on the plastic bag along with the date and location from which the gasket was removed.
9. If gasket debris is on the plastic, remove using a HEPA vacuum and/or wet wiping with amended water and rags. Dispose of rags in the poly bags with the gasket waste. Carefully remove the plastic from the floor, roll or fold into a small bundle, and dispose of in the poly bags with the gasket waste.
10. Transport the sealed waste containing bags to the Environmental Waste Building for disposal. Ensure that proper transport methods are used.

Alternately, Asbestos Glove-Bagging Procedures can be used to remove gaskets smaller than 24 inches in those situations where glove-bags can be successfully sealed around the adjacent piping.

Contact the Safety & Health Department Senior Industrial Hygienist at 623-869-2155 if you have any questions.

Asbestos Procedures for Large Gasket Removal Procedure (greater than 24 inches)

This procedure is to be used for removing large (>24 inches) gaskets, small gaskets (<24 inches) that break/fracture during removal, or any visibly deteriorating gasket. Prior to any gasket removal work, the supervisor should contact the Safety & Health Department to allow for air monitoring of employees exposures at or below the OSHA Permissible Exposure Limit (PEL). Under no circumstances may a gasket be ground or wire wheeled from a surface without prior consent, in writing, from the Safety & Health Department. All gaskets shall be treated as Asbestos Containing Material (ACM) unless proven otherwise through appropriate bulk sampling results. Only employees trained as Asbestos Workers (32 hours of training) and/or Asbestos Contractor/ Supervisors (40 hours of training) can conduct activities to remove gasket material using this procedure.

Procedures:

1. Using “Danger Asbestos” tape, secure the work area at least 20 feet in all directions. Place an “Asbestos Danger” sign in the immediate area of the gasket removal.
2. Place 6-mil polyethylene film (plastic) on the floor or surface below the gasket being removed. The plastic shall extend a minimum of six feet (or as far as practical) in all directions from the gasket to be removed. Secure plastic to floor or surface using vinyl duct tape. Place 6-mil poly as “Critical Barriers” over all HVAC supply/return vents within 30 feet of this regulated area.
3. Thoroughly wet all exposed gasket material with amended water solution (2 oz. of soap per gallon of water) before removing any flange bolts.
4. Put on Personal Protective Equipment (PPE). PPE includes a full-face respirator, Tyvek coveralls or similar, rubber gloves, and rubber boots. Gloves and boots shall be secured to the coveralls with vinyl duct tape or similar taping.
5. Remove the flange bolts and valve to expose the gasket material.

6. Wet the exposed gasket with amended water (water/soap solution) or gasket remover.
7. Apply gasket removal chemical to the gasket material.
8. Remove the gasket from the flanged surface by using a hand scraper or similar tool.
9. Place the gasket material into an asbestos waste bag and seal the bag. Ensure the gasket is visibly wet inside the bag (there should be water droplets throughout the inside of the bag).
10. A label stating “DANGER-CONTAINS ASBESTOS FIBERS-AVOID CREATING DUST-CANCER AND LUNG DISEASE HAZARD” must be placed on the plastic bag along with the date and the location from which the gasket was removed.
11. Thoroughly vacuum (with an approved HEPA Asbestos vacuum) any gasket material from the plastic on the floor or surfaces below the gasket being removed.
12. Empty the vacuum material into the asbestos waste bag, seal and label as above.
13. Notify Safety and Health Department of completion of work for final inspection and clearance of Regulated Area prior to any removal of 6 mil. poly sheeting.
14. Remove the plastic from the floor and place into an asbestos waste bag.
15. Wipe all PPE with a wet cloth and place the cloth into the asbestos waste bag.
16. Remove PPE except for the respirator and place into the asbestos waste bag.
17. Place all bagged ACM, as well as used poly, Tyvek suits, HEPA vacuum wastes, respirator cartridges, etc. into a second asbestos waste bag (Double bagging). Seal and label as above.
18. Doff the respirator. Clean the respirator before returning to a clean zip-lock plastic bag.
19. Transport the sealed waste containing bags to the Environmental Waste Building for disposal. Ensure that proper transport methods are used.

Contact the Safety & Health Department Senior Industrial Hygienist at 623-869-2155 if you have any questions.

CENTRAL ARIZONA PROJECT

BLOODBORNE PATHOGENS PROGRAM

REVISED OCTOBER 1, 2019

1.0 PURPOSE

The purpose of this Bloodborne Pathogens Program is to minimize or eliminate potential employee exposure to human blood and other body fluids or tissues through a combination of training, work practice controls, and personal protective equipment.

While contact with human blood and other infectious material is not a frequent on-the-job occurrence for Central Arizona Project (CAP) personnel, potential exposure may occur in first-aid situations where there are open wounds, if breathing resuscitation efforts are required, or during waste water treatment operations.

1.1 COMPLIANCE STANDARDS: This document was prepared in accordance with the Federal Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens standard (29 CFR 1910.1030) and the U.S. Department of the Interior- Bureau of Reclamation (BOR) Safety and Health Standard.

1.2 PROGRAM COMPLIANCE: Compliance with instructions and procedures contained in the Bloodborne Pathogen Program is mandatory. Willful disregard for this program or any of its provisions may result in corrective action as outlined in the CAP Policy on Corrective Action found in the Employment Section of the Policy Handbook.

2.0 SCOPE

This program is intended to reduce or prevent exposures to bloodborne pathogens for all CAP employees. Employees listed in Section A of Attachment A may have occupational exposures to blood and other infectious materials during the course of their work and will be required to comply with all sections of this program. Those employees listed in Section B are not expected to have occupational exposures to bloodborne pathogens except when giving voluntary first-air procedures. These employees, due to their work in Safety-Sensitive positions, have a greater potential for voluntary first-aid and therefore receive first-aid/CPR training. They must be in compliance with Sections 4.0, 6.0, and 7.0. Employees not listed in Attachment A will be required to comply only with Section 4.1 and 4.2, General Requirements.

3.0 DEFINITIONS

Note: Definitions for most of the terms found in this program are the same as those in the OSHA standard found at 29 CFR 1910.1030. However, for ease of use a few of those terms, as well as those unique to CAPs' program, are found below:

Responding Employee(s) means CAP employees who are identified in Section A of Attachment A of this written program. These include Protective Services, Safety and Health, Environmental, and several employees who work with the septic systems at CAP buildings.

Exposure Control Plan means the engineering controls, work practices, and/or personal protective equipment used to protect employees from exposures to bloodborne pathogens.

Occupational Exposure means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Safety Sensitive Employee(s) means CAP employees who are identified in Section B of Attachment A of this written program. This listing is essentially all employees that are in Safety-Sensitive positions. These employees are not responsible for cleaning up blood or other potentially infectious materials, but may potentially be exposed during the course of providing first aid.

Other Potentially Infectious Materials means (1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Regulated Waste means liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.

Other Employee(s) means all CAP employees who are not identified in Section A or Section B of Attachment A of this written program.

4.0 GENERAL REQUIREMENTS

4.1 EXPOSURE CONTROL PLAN: To minimize the risk of contracting bloodborne diseases in the workplace, employees exposed to bloodborne pathogens will comply with the following Exposure Control Plan:

- Appropriate vinyl or latex gloves are available in CAP first-aid kits. However, if a serious first-aid incident occurs and gloves are not available, minimize exposure by using any appropriate and available barrier when responding to the injury.
- Use micro shield or mask as instructed in the CAP First-Aid/CPR training. Micro shields are available in the company first-aid kits.
- If using syringes/needles to self-administer allergy or insulin shots, do not dispose of the used needles in company trash containers. An approved medical waster disposal container is available in warehouse stock for needles and must be used in these cases. The waste is to be disposed of as Regulated Waste with the Environmental Compliance Department.

- Wear latex or vinyl gloves when directly handling human blood, bloody materials, bodily fluids, or sewage. After finishing, carefully remove gloves and wash hands thoroughly (minimum of 30 seconds) with hot water and soap.
- Dispose of contaminated material by classifying them as either :

  "Solid Waste": Material containing small amounts of dried blood, dried body fluids, or dried waste water materials.

  OR

  "Regulated Waste" ("Bio-Hazard Medical Waste"): Material saturated with blood that could release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed, or items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling. This includes used needles.
- Use the appropriate disposal method according to solid or regulated waste descriptions. Call the Safety and Health Department at X2155 for decision support.

  Solid Waste Disposal Method: Double bag and seal immediately after first aid incident occurs. Place in dumpster.

  Regulated Waste Disposal Method: Double bag using a red Bio-Hazard bag as outer bag and seal completely. Call Environmental Compliance, at X2353, for specific disposal procedures.
- NOTE: Only those employees listed in Section A of Attachment A can perform bloodborne pathogen clean-ups. Wear vinyl or latex gloves when cleaning up equipment or work areas which have had contact with any bloodborne pathogens. Use an 8-to-1 solution of tap water and regular bleach to clean the equipment or areas (other approved biocides may be used as directed by the Safety and Health Department).

4.2 **REPORTING REQUIREMENTS**: If another person's blood is transferred to an employee rendering care such that it may enter a break in the employee's skin (rash, cut, abrasion, etc.) or enter a mucous membrane (mouth, nose, eyes), that employee must report the incident to the Safety and Health Department as soon as possible. The Safety and Health Department will follow the Post Exposure follow up procedures outlined in Section 9.0 of this program. It is important that post-exposure vaccination be made available to the exposed employee within 24 hours of the exposure incident. Records will be retained as per Section 10.0 of this program.

Employees may not need Post Exposure follow-up if the exposed employee is confident that **all** of the following conditions have been met. The exposed employee does not have a skin break in the exposed area,

- There was no puncture wound, and

- Another person's blood does not splash or transfer into the exposed employee's nose, mouth, eyes, or onto an open wound.

4.3 INFORMATION AND TRAINING

4.3.1 Participating employees listed in Section A of Attachment A will be provided with bloodborne pathogen training at least annually. That training will consist of the elements detailed in the OSHA regulations at 29 CFR 1910.1030(g)(2)(vii).

4.3.2 Employees listed in Section B of Attachment A will be trained using the American Heart Association or similar curriculum that includes a section on the hazards of bloodborne pathogens as well as those items above that are unique to CAP employees.

5.0 EXPOSURE DETERMINATION AND PARTICIPATION LIST

The Safety Manager will review employee job duties to determine risk to the employee from exposure to blood or other potentially infectious materials. Employees will fall into one of three basic categories: 1) Responding Employees: those with "reasonably anticipated occupational exposures" to blood or other potentially infection material (Section A of Attachment A). Employees in this exposure category are required to comply with Sections 6.0 through 9.0 of this program; 2) Safety Sensitive Employees: those with increased potential for performing volunteer first-aid services (Section B of Attachment A); and 3) Other Employees: those with little chance of contact with bloodborne pathogen materials on the job. While employees that are not in the Section A category do not have a reasonable expectation of exposure, it is always possible. All employees are expected to take any precaution available to them to prevent exposure.

6.0 UNIVERSAL PRECAUTIONS

The Universal Precautions described below will be used whenever employees could have exposure to blood or other potentially infectious material.

6.1 EMPLOYEE RESPONSIBILITIES: Employees are required to use the following measures to protect themselves from blood or other potentially infectious materials**.**

6.1.1 Gloves and Other Personal Protective Equipment: Gloves will be worn whenever there is potential for the hands to come in skin contact with blood, infectious materials, mucous membranes, non-intact skin, or surfaces and materials soiled with blood or other potentially infectious materials. Disposable gloves will be replaced as soon as possible when they are torn, punctured, or may no longer provide a barrier to contamination.

6.1.2 Hand washing: Employees will wash their hands with hot water and soap immediately after removing protective gloves or other PPE and after hand contact with blood or other potentially infectious materials. If working away from a facility with water supply, disinfecting towelettes or waterless hand sanitizing solutions should be used.

6.1.3 **Special Cleanup:** The Environmental, Health and Safety (EH&S), and Protective Services Departments will perform any bloodborne pathogen clean up when there has been what is considered a minimal release. An experienced contractor will be used to perform any clean ups where the release is more than minimal. Minimal is considered a release where there is no pooling of the released body fluid. In the event of excessive contamination of bloodborne pathogens (pooling occurs), the EH&S Department will supervise the cleanup of potentially pathogenic materials.

All PPE will be removed immediately after completion of the task being performed and placed in a designated appropriate area or container for washing, decontamination, and/or disposal.

6.1.4 **Work Practice Controls**: It is prohibited to eat, drink, smoke, apply cosmetics or lip balm, handle contact lenses, or store food and beverages in areas of possible bloodborne pathogen contamination or occupational exposure to bloodborne pathogens.

All procedures involving blood or other potentially infectious materials will be performed in such a way to minimize splashing, spraying, or the production of aerosols. Direct mouth to mouth contact is discouraged and resuscitation procedures should be performed with mouthpieces, resuscitation bags, pocket masks or other ventilation devices.

Potentially infectious broken glassware and other sharp items will not be picked up directly by hand but will be manipulated using mechanical devices such as a brush, dust pan, tongs, forceps or cotton swabs. Any container used to hold potentially infectious materials will be closeable, leak proof, and display the universal biohazard symbol. If the outside of the container is likely to be contaminated, a second leak proof container will be placed over the first, labeled as above, and closed to prevent leakage during handling, storage, and transport. If puncture of the first container is likely, both containers will be puncture resistant. The above container's disposal method will comply with federal, state and local regulations.

Any sharps will be placed immediately in closable, puncture resistant and disposable containers which are leak proof on the bottom and sides and display the universal biohazard symbol. These containers will be easily accessible to personnel in the immediate area of use and will be replaced routinely and not allowed to become overfilled. Sharps containers are a warehouse stock item.

6.1.5 **Disposal of Personal Protective Equipment**: Employees will use disposable coveralls to prevent contamination of clothing. These items are a warehouse stock item and will be provided to each employee who has the potential to be occupationally exposed to blood. The coveralls will be disposed of according to the disposal protocol listed in the Exposure Control Plan (Section 4.1).

6.2 DEPARTMENTAL RESPONSIBILITIES: CAP Managers are required to ensure that all bloodborne pathogen program components are known, understood, and followed by Responding Employees (Section A of Attachment A).

6.2.1 Personal Protective Equipment: CAP will provide appropriate PPE and ensure that Responding Employees use the appropriate protective equipment and follow the above listed Universal Precautions.

The supplied equipment may include items such as disposable or reusable gloves, fluid-proof aprons, coats, head and foot coverings, face shields, masks, eye protection, mouthpieces, resuscitation bags, pocket masks, or any other device which would protect the worker from work exposure.

PPE will be provided in the appropriate sizes for Responding Employees and will be readily accessible at the work-site or issued to the employee. If an employee is allergic to the gloves normally provided, hypoallergenic gloves will be provided for that employee.

7.0 COMMUNICATION OF HAZARDS TO EMPLOYEES

7.1 LABELS AND SIGNS: Warning labels will be fixed (to prevent their loss or accidental removal) to containers or equipment containing contaminated material. These labels will be burnt orange with lettering of a contrasting color and will display the universal biohazard symbol.

Signs will be posted at the entrance to any work area where potentially infectious material is located. The sign will include:

1. The word “Biohazard” and the universal biohazard symbol with the sign being orange red with letters of a contrasting color.
2. The name of the infectious agent.
3. Any special instructions for entering the area, and the name and telephone number of the supervisor of the area.

8.0 MEDICAL PROPHYLAXIS

CAP will make Hepatitis B Virus vaccination available, within 10 working days of initial assignment, to all Responding Employees. Additionally, vaccinations will be offered within 24 hours as post-exposure medical follow-up for <u>any</u> CAP employee with an occupational exposure incident. This will include those employees listed in Attachment A, Sections A & B as well as any other employee wishing such treatment after a first-aid exposure incident.

8.1 VACCINATION PROGRAM: All Responding and Safety Sensitive Employees will state their intention of accepting or not accepting the Hepatitis B Vaccination by completing

the Employee Hepatitis B Vaccination Acceptance/Declination Form. Should an employee who initially declines the vaccination decide at a later date (while still covered under this policy) to receive the vaccination, it will be provided at that time. If booster doses are recommended at a later date, they will be provided upon the advice of a physician. A copy of CAP's Acceptance/Declination form is in Appendix B.

9.0 POST EXPOSURE EVALUATION AND MEDICAL FOLLOW-UP

An exposure to blood or other potentially infectious materials include such things as needlesticks, splashes of blood or body fluids, and unprotected resuscitation attempts. Such incidences will be reported to the EH&S Department and recorded on the Exposure Incidence form in Attachment C of this program. Additionally, the Industrial Commission of Arizona form ICA 04-614-91, "Report of Significant Exposure to Bodily Fluids", must also be filled out within 10 calendar days after exposure and submitted to CAP Risk Management.

9.1 POST EVALUATION EXPOSURES: The post exposure evaluation will include at least:

- Documentation of the exposure route, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immune-Deficiency Virus (HIV) antibody status of the source individual (if known) and the circumstances of the exposure.
- If the alleged source individual knowingly and willingly consents in writing, the alleged source individual's blood will be tested to determine the presence of HIV and/or HBV and HCV infection.
- The alleged source person's test results will be made available to the exposed employee if the alleged source individual knowingly and willingly consents to release of this information.
- Blood collection from the exposed employee will be done as soon as feasible after the exposure incident, but not more than 10 days after exposure. This blood draw is to establish a baseline of viral infection. Actual testing of the sample may be done at that time or at a later date if the employee so requests. A written consent to this blood collection should be completed.

CAP will provide the following to the evaluating physician:

- A copy of this policy and the OSHA standard and its appendices.
- A description of the employee's occupational duties as they relate to occupational exposure.

9.2 PHYSICIAN'S WRITTEN OPINION: For each employee, CAP will obtain from the physician a copy of the physician's written opinion and provide a copy to the employee within 15 days of the completion of the evaluation. Each written opinion will be limited to the following information:

- The physician's recommendations on the ability of the employee to receive the HBV vaccination.

- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure which might require further evaluation or treatment.
- Those specific findings which are related to the employee's ability to receive Hepatitis B and/or Hepatitis A vaccinations. Any other findings will remain confidential and will not be included in the written report.

10.0 RECORDKEEPING

Training and medical records will be maintained in the following manner:

10.1 MEDICAL RECORDS: An accurate record will be kept for each employee regarding his/her hepatitis B status and will include the following:

- Name and employee identification number.
- A copy of the employee's hepatitis B vaccination records relative to the ability to receive the vaccination and the circumstances of any exposure incidents.
- A copy of all results regarding the physician's examination, testing, and post exposure follow-up results.
- A copy of the physician's written opinions.
- A copy of the information that is required to be provided to the physician.

These records will be kept confidential and the information will not be reported to anyone except:

- Examination and copying by the employee.
- At the knowing and willing written consent of the employee.
- As required by law.

These records will be maintained during the duration of employment plus 30 years. They will be maintained by the EH&S Department.

10.2 TRAINING RECORDS: Records of training will include the following:

- A copy of the current training list of at-risk personnel with the current training status of each employee.
- The dates of the training sessions and the name of the instructor.
- A written summary of the contents of the sessions.
- Trainers name and qualifications.
- The names and job titles of all persons attending the sessions.
- These records will be maintained for three years.

The records will be made available only:

- Only to the employee for examination and copying (as detailed in OSHA 1910.1020).
- To anyone who has the written consent of the employee.
- As required by law.

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ATTACHMENT A

EXPOSURE DETERMINATION AND PARTICIPATION LIST

A. The following CAP employee job titles have the potential to be occupationally exposed to blood and other infectious materials. They are identified in this program as Responding Employees.

1. Environmental, Health and Safety (EH&S) Department employees.
2. Protective Services Department employees.

B. The following CAP personal and their respective Supervisors are considered to be at the first-aid/CPR level exposure and are identified in this program as Safety Sensitive Employees.

Listing of all Safety Sensitive positions

Administrator - Technical	PMO Manager
Apprentice	Senior Electrician (Supervisor)
Assistant - Office & Clerical	Shop Mechanic
Electrician	Specialist - Materials Control
Engineer	Specialist - Officer & Clerical
Engineer, Senior	Specialist - Professional
Field Maintenance Engineer I	Specialist - Technical
Inspector	Specialist - Paraprofessional
Lead Maintenance Specialist	Supervisor
Maintenance Specialist	Supervisor - Construction Inspection
Maintenance Worker	Surveyor
Mechanic	Technician
Mechanic - Machinist	Universal Equipment Operator
Planner	Worker

ATTACHMENT B

EMPLOYEE HEPATITIS B VACCINATION ACCEPTANCE/DECLINATION FORM

NAME (Please Print): _____

EMPLOYEE ID #: _____

ACCEPTANCE FORM

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring a Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at not charge to myself. I choose to receive the Hepatitis B vaccination at this time. I also understand that the vaccination consists of a series of 3 shots over a given time period and a final injection to measure the effectiveness of the vaccines.

Physician: _____ Date: _____
or Physician Assistant (Signature)

Employee: _____ Date: _____
(Signature)

DECLINATION FORM

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring a Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at not charge to myself. However, I decline the Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease, if exposed to blood or other human body fluids. If in the future I continue to have occupational exposure to bloodborne pathogens and I decide to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Physician: _____ Date: _____
or Physician Assistant (Signature)

Employee: _____ Date: _____
(Signature)

APPENDIX C

Exposure Incident Report

PLEASE PRINT

Date: _____

Employee's Name: _____ **Employee #:** _____

Date of Birth: _____ **Department:** _____

Job Title: _____

Date of Exposure: _____ **Time of Exposure:**

_____**AM/PM**

Hepatitis Vaccination Status: _____

Location of Incident: _____

Describe duties employee was performing when incident occurred: _____

_____

_____

What body fluids was the employee exposed to: _____

Route of exposure (e.g. contact with non-intact skin, percutaneous, mucosal contact): _____

_____

PPE in use at time of Incident: _____

Did PPE Fail, if so, how: _____

Identification of source individual (s) (names): _____

Other pertinent information: _____

_____

Signatures/Date:

_____ _____

Safety and Health Department Supervisor

Original: Safety and Health Department Copies: Risk Management

CENTRAL ARIZONA PROJECT

CONFINED

SPACE ENTRY PROGRAM

REVISED OCTOBER 1, 2019

1.0 PURPOSE

The purpose of this document is to specify procedures for Central Arizona Project (CAP) employees to identify, safely enter, work in, and exit from confined spaces. It also is to ensure compliance with the Occupational Safety and Health Administration standard for Permit-Required Confined Spaces, §29 CFR 1910.146, and 29 CFR 1926.1200.

2.0 POLICY

2.1 It is CAP's policy that every entry into a confined space by company employees will be made in accordance with the procedures contained herein. All requests or proposals for contractors to bid on work to be performed within a confined space will contain statements informing contractors of CAP's requirement for a written Permit-Required Confined Space program and mandating their compliance with all Federal, State, and Local requirements related to entry into confined spaces.

2.2 Under no circumstances will CAP employees enter into any confined space that has an atmosphere that has not been tested and determined to be acceptable for continuous breathing. If an unusual circumstance arises that makes it necessary for workers to enter a confined space with an atmosphere that does not present acceptable breathing conditions as outlined in section 6.2, prior approval must be obtained from the Environmental, Health, and Safety Department Manager or designee.

2.3 Compliance with instructions and procedures contained in this Confined Space Entry Program is mandatory. Willful disregard for this program or any of its provisions will result in corrective action as outlined in the CAP policy on Corrective Action.

3.0 SCOPE

This procedure applies to all CAP employees entering or working in confined spaces and to all contractors performing work in confined spaces within Central Arizona Water Conservation District's facilities or owned properties. Contractors using their own company confined space entry program must have the program approved as outlined in Section 11.0 of this program.

4.0 DEFINITIONS

The CAP Confined Space Entry Program uses the same definitions as are found in the Occupational Safety and Health Administration (OSHA) standards, with the following additions:

"Immediately Dangerous to Life or Health (IDLH)": Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

"Serious hazard(s)": By definition, a confined space must include one or more of four characteristics to be considered a permit-required confined space. Characteristic number four is:

> "Contains any other recognized *serious safety or health hazard*."

OSHA has clarified that a serious safety or health hazard, as used in this context, is one that is immediately dangerous to life or health. The question that must be determined is whether the resulting exposure to a hazard in a confined space will impair the employee's ability to perform self-rescue. If an existing or potential hazard within a space could impair the employee's ability to self-rescue, then the hazard would be considered "serious" and should be addressed during the pre-entry evaluation of the space, including noting both it (the hazard) and appropriate control procedures on the entry permit.

5.0 IDENTIFICATION OF PERMIT-REQUIRED CONFINED SPACES

An extensive survey has been conducted of potential confined spaces at CAP. Many, but not all of the spaces identified as confined spaces have been labeled with a cautionary red and white placard similar to this one:

A listing of the general types of confined spaces at CAP is provided as Attachment B to this program. Since all spaces are not labeled (and many are not practical to label due to their type, configuration and location) it is important that appropriate employees be trained and able to recognize if a space meets the definition of a confined space. If in doubt, consult the EH&S department.

6.0 IDENTIFICATION OF POTENTIAL HAZARDS

Many types of hazards can exist within confined spaces at CAP facilities. The following are a few of the more common:

6.1. Engulfment: Engulfment is the surrounding or capturing of an individual by a liquid or a finely divided, loose (flowable) solid substance (e.g., sand, grain, sawdust, etc.). Injury or

death is caused by crushing, collapsing of the lungs, and/or suffocation or drowning. Water is a common engulfment hazard at CAP.

6.2 **Hazardous Atmosphere**: Hazardous atmospheres account for the majority of fatalities that occur in confined spaces. A hazardous atmosphere in a CAP confined space can be created through decomposition of aquatic life (ammonia), application of chemical coatings, or other work processes.

Because all confined spaces at CAP are initially considered permit-required confined spaces, any effort to enter or reclassify the space must first include atmospheric monitoring. Such monitoring must be conducted in the following sequence and results must be within the noted ranges/limits:

I. oxygen concentration: must be maintained between 19.5% and 23.0%;

II. combustible gases/vapors: must be maintained at less than 10% of the lower explosive limit (LEL);

Note: combustible vapors will not register on the meter properly if oxygen levels are outside the range noted above.

III. Toxic gas/vapor: carbon monoxide must be less than 25 ppm and hydrogen sulfide less than 5 ppm.

Note: If concerns arise regarding other toxic contaminants employees should not enter the space until the EH&S department has been consulted.

6.3 **Mechanical and electrical hazards**. Confined spaces may also pose mechanical hazards created by moving equipment or parts and energized systems. It is important to first identify any mechanical hazards present and effectively deactivate the system in accordance with standard hazardous energy control procedures.

6.4 **Other hazards**: To the extent that they may create a situation that prevents an entrant from self-rescuing – and therefore a situation that is immediately dangerous to life or health (see definition of "serious hazard" in section 4.0) – other hazards may also need to be considered and addressed before entry, including:

- corrosive chemicals such as acids, cleaning solutions, etc.;
- snakes, rodents, scorpions, and spiders;
- chemical reactions from products stored in confined spaces;
- welding, spray painting, grinding, brazing, sand blasting;
- inerting with non-flammable gases (MIG and TIG welding);

7.0 ENTRY PROCEDURES

The following procedures are to be used for all entries into all confined spaces on CAP property by CAP personnel. **It is CAP policy to treat every confined space as a permit-required space unless and until it is proven to be a non-permit required space.** By following proper procedures to eliminate or control any potential or existing serious hazards (see definition), employees should be able to reclassify most every space from a permit-required space to a non-permit required space. However, the fact most spaces can be reclassified does not relieve employees from the duty to comply with these entry procedures – including the duty to complete all relevant portions of an entry permit – for every confined space entry. Your life or the life of a coworker may depend on adherence to safe entry procedures – every time!

7.1 Initial space evaluation: *A safe confined space entry begins with the proper identification of all potential or existing serious hazards within the space. If necessary, contact the asset owner to assist in the identification of all such hazards.*

7.1.1 Once the potential or existing serious hazards of the space have been identified, use a computer or other device to open a new confined space entry form in Content Server. (A link to the confined space workflow is located in the Safety Resource Center.) Complete the following information on page one of the permit (items in red are required for printing).

7.1.1.1 Work order number

7.1.1.2 Space to be entered

7.1.1.3 Purpose of entry

7.1.1.4 Location of space entry point

7.1.1.5 Duration date(s) and times

7.1.1.6 Hazards and controls (Note: for every potential or existing serious hazard, you **MUST** indicate the method(s) that will be used to eliminate or control the hazard. If help is needed to identify hazards and controls, check with the asset owner and/or the EH&S department.)

7.1.1.7 Equipment required for entry

7.1.2 If the space can be reclassified to a non-permit space, select the "entry coordinator" and click "submit."

7.1.3 If the space cannot be reclassified to a non-permit space, you must select the appropriate "entry supervisor," list the "entrants" and "attendants" and list appropriate rescue procedures on the permit.

7.1.4 Select the appropriate supervisor for the project

7.1.5 Once the form has been submitted, you will receive an email with a link to the final form.

7.1.5.1 Click on the link to open the form and print the form/permit.

7.1.5.2 Closeout the workflow by clicking "submit" at the bottom of page two.

7.1.5.3 If necessary, make sufficient copies to post one at each entry point. Plastic sleeves are available in the warehouse for posting in the elements.

Note: An entry form is valid for seven (7) days. If space entry will occur more than seven days, a new form will need to be completed.

7.2 **On Site Procedures:** Proceed to the workspace entry location. Be sure to bring the printed form and sufficient copies for posting at each entry location. Be sure to bring a calibrated monitor and enough tubing to reach to the bottom of the space. If necessary, obtain a monitor and accessories from the EH&S office. Finally, be sure to bring railing or other fall protection if you will be over a vault or similar opening.

7.2.1 Re-evaluate the space, without entry, to be sure all serious safety and health hazards have been identified and control measures are in place. All hazards and control methods must be listed on page one of the form. If unforeseen hazards and controls are found record those in writing on the form.

7.2.1.1 Have all non-atmospheric hazards been identified and eliminated or controlled?

7.2.1.1.1 **No**: STOP! Do not proceed until this is accomplished.

7.2.1.1.2 **YES**: Proceed to step 7.2.2

7.2.2 Conduct atmospheric testing: Once all non-atmospheric hazards have been identified and either eliminated or controlled, proceed to the atmospheric check. Open the confined space and test the internal atmosphere using a calibrated monitor. Note: if the space is equipped with a ventilation system, do not turn it on at this time.

Vertical spaces (i.e., vaults): The atmosphere inside the space must be tested every 10 feet of depth. All sampling is conducted from outside the space. Connect a length of tubing to the meter sufficiently long to reach the bottom of the space. Place the end of the tube approximately two or three feet into the space. Wait one minute to ensure the sampled air reaches the meter. Lower the tube 10 feet and wait an additional minute. Repeat this process for each additional 10 feet of space depth.

Horizontal spaces: The atmosphere is tested using a horizontal sampling probe which can be obtained from EH&S. The first readings are taken prior to any entry into the space. Extend the probe to its fullest length, and with the meter running, insert the probe two or three feet into the space. Wait one minute to be sure the meter samples the air from that portion of the space. Next, insert the probe as far into the space as possible without bodily entry and wait again as the meter samples the air. Continue sampling in front of you as you enter further into the space.

7.2.2.1 Record the atmospheric testing results on the permit. Sampling results must be within the following limits to prove the absence of an atmospheric hazard within the space.

7.2.2.1.1 Oxygen level between 19.5% and 23.0%

7.2.2.1.2 Combustible gases at or below 10% of the lower explosive limit (LEL),

7.2.2.1.3 Carbon monoxide less than 25 parts per million (ppm), and

7.2.2.1.4 Hydrogen sulfide less than 5 ppm.

7.2.2.2 Are the atmospheric monitoring results within acceptable limits?

7.2.2.2.1 **Yes**: If the atmosphere tests within the allowable limits and other IDLH atmospheric hazards will not be introduced during the scheduled work, the space may be reclassified as a non-permit required space and entry may proceed following a Pre-Job Briefing (See section 7.2.3). Be sure to make any required notifications (i.e., to the Control Center).

7.2.2.2.2 **No**: If the atmosphere does not test within the allowable limits, the space may NOT be reclassified to a non-permit space. Rather, employees should ventilate the space with the installed ventilation system or with a portable power ventilator for 30 minutes and then repeat the atmospheric testing. To properly ventilate the space with the portable unit, ducting should be lowered to the bottom of the space so that the introduced fresh air will force the contaminated air out of the space.

7.2.2.2.2.1 If the repeat testing results in an atmosphere within allowable limits, the space may be entered under OSHA's alternate entry procedures. However, in this circumstance – where power ventilation has made the atmosphere safe for entry – the ventilation system must remain operational during the entire entry and the atmosphere maintained safe for entry at all times. Prior to entry write Alternate Entry at the top of the permit form.

7.2.2.2.2.2 If the repeat testing does not result in a safe atmosphere, the space must remain classified as a permit-required confined space. Entry into the space may NOT proceed without further guidance from the EH&S department.

7.2.2.3 Note regarding atmospheric monitoring: If the space to be entered has aquatic life decay (i.e., decaying quagga mussels), contact the EH&S department to obtain an ammonia monitor. A space with ammonia levels less than 25 ppm can be reclassified to a non-permit space. A space with ammonia levels greater than or equal to 25 ppm will remain a permit space

but can be entered using OSHA's alternate entry procedures if continuous forced air ventilation will reduce those levels to less than 25 ppm.

7.2.3 Pre-job briefing: Prior to entering the confined space – but after all serious hazards including actual or potential atmospheric hazards have been identified, and eliminated or controlled – conduct a pre-job briefing following the talking points listed on the pre-job briefing form and the confined space form.

7.2.4 Space entry: After ensuring all serious hazards within the space have been eliminated or isolated, including any actual or potential atmospheric hazards, the pre-job briefing has been conducted, and any required notifications have been made, the space may be entered. At this time, if there is an installed ventilation system that has not been turned on, turn it on now.

7.2.4.1 The air monitor must be taken into the space to provide a continuous air quality test during the entry. Additional air monitor readings only need to be recorded on the permit if the space is left unoccupied and then reentered, such as after lunch or other break or at the start of a new work shift. As long as acceptable entry conditions are maintained – and no other serious hazards are introduced – the space will remain a non-permit required space without further entry obligations for the duration of the permit (not to exceed 7 days).

7.2.5 Permit-required confined space: If after following the above procedures all serious safety and health hazards in a confined space cannot be eliminated or controlled, the space must remain classified as a permit-required space. In all such cases, potential entrants must do all of the following:

7.2.5.1 **Contact the EH&S department for assistance in entering the space**; AND

7.2.5.2 Provide onsite crews and resources, either internal (CAP) or external (3rd party), to ensure the ability to immediately rescue space entrant(s); AND

7.2.5.3 Provide all entrants with all necessary PPE or other gear to ensure their safety.

7.3 Post space-entry procedures: Following completion of work within a confined space, the entry permit and all other appropriate documentation must remain with the work order package.

8.0 DUTIES

Individuals involved in confined space entry have specific duties, depending upon their role. The following descriptions highlight some of those duties.

8.1 **Entrant:** Any trained and certified CAP employee or contractor, properly entering a confined space, is designated as an Authorized Entrant. An entrant's job is to complete the scheduled work in a safe manner. This requires that the entrant know the potential hazards associated

within a specific permit space, be able to recognize the signs or symptoms of exposure, and understand the consequences of exposure to the hazard(s). The entrant must have an opportunity to observe the atmospheric testing and know the results of any testing completed on the space.

All entrants must exit from the confined space as quickly as possible when any of the following occur:

- the Attendant or Entry Supervisor orders an evacuation,
- the entrant recognizes any warning sign or symptom of exposure to a hazardous substance,
- the entrant detects a prohibited condition,
- an alarm is activated on the confined space air monitor.

8.2 **Attendant**: All Permit Required confined space entries require a trained employee to be designated as the attendant. The primary duty of the attendant, when employees are inside the confined space, is to remain outside the confined space and maintain communication with the employee(s) inside the space and monitor their status. In the event of an emergency or other condition requiring space evacuation, the attendant orders an evacuation and summons rescue and emergency services.

The attendant **will not** perform other duties that may interfere with the Attendant's primary duty to monitor and protect the authorized entrant(s).

Entries into spaces that have been reclassified to non-permitted do not require an attendant. If the complexity of entry into a non-permitted space warrants it a hole-watch can be designated to handle some or all of the duties of an attendant.

8.3 **Entry Supervisor**: Every permit-required space entry requires an entry supervisor who has overall accountability for safe entry operations. The entry supervisor must verify the existence of acceptable entry conditions and the presence/availability of rescue and emergency medical services; authorize the entry (which is evidenced by a signature on the permit); oversee entry operations; remove unauthorized persons from the space; and terminate the entry operations when necessary.

8.4 **Entry Coordinator**: The Entry Coordinator is the lead responsible person "on-site" during any Permitted or Non-Permitted confined space entries. In cases where the work crew Supervisor is on-site, they fulfill the duties of the Entry Supervisor. In cases where the Entry Supervisor cannot be on-site during a confined space entry, then the Entry Coordinator assumes the Entry Supervisor's duties at the entry site, as listed above in Section 8.3.

When completing an online confined space form, the Entry Coordinator must be the person originating the on-line form. At the bottom of page 1 of the on-line form the Entry Coordinator should select their name from the drop-down list and e-sign the document in the adjacent space. The box is labeled "Entry Coordinator. Your electronic signature

indicates your agreement to serve as the Entry Coordinator, assuming the on-site responsibilities of the Entry Supervisor in their absence.

9.0 EMERGENCY PROCEDURES

Planning for emergencies should be a part of any confined space entry, but such planning is REQUIRED when entry is made into a permit-required confined space. Additionally, on-site rescue services or the ability for CAP to perform non-entry rescue are also required for any permit-required space entry. (Note: Entry into a non-permit required spaced does not require on-site rescue services or the ability for non-entry rescue since any serious or life-threatening hazards have already been eliminated or controlled. In the event of an emergency, entry may be made into the space as needed to render aid. See section 9.2 below.)

9.1 Permit Required Confined Space Rescue. "Rescue" means the retrieval of a *permit-required* space entrant who has become debilitated due to a medical condition or to hazards within the space. A rescue can be accomplished either by entry into the space, or by non-entry.

9.1.1 Rescue via space entry: Entry into a permit-required confined space for purposes of rescue will ***only*** be conducted by outside emergency services. Under no conditions are CAP employees allowed to enter a permit-required confined space to attempt rescue of another employee. Rescue services are provided by organizations under contract to CAP or by a few qualified municipal fire departments.

Prior to issuing a permit-required confined space entry permit, the Entry Supervisor must make contact with an appropriate rescue service to ensure the following:

- The rescue service is available for call-out to conduct confined space entry rescue during hours that CAP personnel will enter a permit-required confined space,
- The rescue service can reach the site of the permit required confined space entry to initiate rescue entry within a reasonable time period. For example:
    - if the permitted space has a toxic atmosphere approaching the IDLH, the rescue service should be on-site during all entry operations;
    - if the permitted space has a hazardous atmosphere with concentrations above the PEL but less than one-half of the IDLH, then the rescue service should be within 5 to 10 minutes of effecting a rescue;
    - if the permitted space has a hazardous atmosphere with concentrations less than or equal to the PEL, then the rescue service should be within 10 to 15 minutes of effecting a rescue.
    - If rescue services could, at any time during the entry, be more than 15 minutes away from effecting a rescue, then the service must be on-site during the Permit Required confined space entry.

Note: If the off-site rescue service receives another call for service, their dispatcher must notify the Entry Team and the team must suspend entry operations until the service is again on stand-by.

If a rescue operation has been undertaken and Entrant(s) are being transported to a medical facility for further care, a copy of any SDSs for chemicals in use inside the space will be provided to the rescue service and will accompany them to the medical facility.

9.1.2 Rescue via non-entry (i.e., self-retrieval): Non-entry rescue means the removal of an Entrant(s) by an outside crew of one or more persons who do not enter the confined space. Some confined spaces are configured in such a way that non-entry retrieval can be accomplished by the outside Attendant(s) or other personnel. If the configuration of the space is such that the Entrant(s) must work some distance away from the entry point, travel over or under interior piping systems, or move around corners into other areas of the confined space, then non-entry retrieval is not possible and outside rescue services must be acquired.

For effective non-entry retrieval, each Entrant should have an assigned Attendant with a retrieval davit-arm or tripod and hoist system for that Entrant. In the event of an emergency requiring non-entry retrieval there would not be time to retrieve one Entrant and then lower the hoist system for the second or third Entrant.

All Entrants entering into permit-required confined spaces greater than 4 feet in depth will wear a full-body harness. Confined space depths greater than 4 feet are covered by the CAP Fall Protection Program and the harness will be provided and operated according to the Fall Protection requirements. The harness can also facilitate retrieval and/or rescue procedures.

9.2 Rescue or Retrieval from Non-Permit Spaces: Outside rescue services and non-entry retrieval equipment are not required for Non-Permit Confined Spaces. The fact that the spaces are non-permit spaces means any serious or life-threatening hazards within the space have been eliminated or controlled. As such, any confined space trained employee may enter the space to assist in a rescue or retrieval or provide first aid.

Always verify that hazards have not returned to the space or that the controls for the hazards have not failed before allowing entry into the space. Any time a control for a confined space fails, the entrants must immediately exit the space and be accounted for. Reentry into the space will not occur until the reason for the failure has been identified and corrected.

If two or more employees are working together inside a non-permit required confined space and one employee appears to be having problems and needs to exit the space, the other employee(s) may assist in the exit procedures. Note the readings on the air monitor.

10.0 HOT WORK

Hot work such as riveting, welding, cutting, burning, and heating may need to be conducted by CAP employees in confined spaces. In those situations, work will proceed after ensuring the confined space is continuously monitored, continuously ventilated, and a Hot Work Permit is posted at the entrance to the space.

11.0 CONTRACTORS AND CONTRACTOR WORK

Whenever outside contracted personnel are to be engaged in activities involving entry into confined spaces, the outside contractor must comply with the requirements of the OSHA Confined Space Standards (29 CFR §1910.146 or 29 CFR §1926.1200). The outside contractor will provide a copy of their written confined space entry program for review by the CAP EH&S Department prior to confined space work on Central Arizona Project properties.

The Bureau of Reclamation Safety and Health Standard (revision 2001) states in 14.4.1(m) "If confined spaces are to be entered by contractors or other outside entities who do not normally work in that facility, either alone, or in conjunction with the facility staff, the program must describe the coordination and controls which will be applied to such outside entity to assure a safe entry into a confined space".

Furthermore, OSHA's Confined Spaces in Construction standard requires permit confined space entry communication and coordination between contractors and the host employer. To achieve those requirements, the following actions will be taken:

11.1 CAP will inform the outside contractor of:

- The location of each known permit space.
- The hazards or potential hazards in each space or the reason it is a permit space; and
- Any precautions that have previously been used for the protection of employees in the space.

11.2 Each contractor with whom CAP has a contractual relationship will:

- Provide formal documentation of their company's confined space entry procedures to CAP's Engineering Project Manager and EH&S Department.
- Obtain from CAP information about permit space hazards and previous entry operations.
- Coordinate entry operations with the CAP's EH&S Department and CAP's Control Center.
- Provide the following information to any of their subcontractors that will make entry into the permit space:
    - Information received from CAP
    - Any additional information the contractor has about the location of permit spaces, hazards of those spaces and precautions for entering the spaces.
    - The precautions that CAP or the contractor implemented for protection of employees in the permit spaces.

- Inform the Engineering Project Manager of any entry procedures that will be followed and of any hazards anticipated to be created during the entry operation.

11.3 **Entry contractors**. Prior to entering a permit space, each entry contractor must:

- Obtain all of the information regarding permit space hazards and entry operations, and
- Inform the controlling contractor and CAP of the permit space program that the entry contractor will follow.

11.4 CAP and all contractors must coordinate permit space entry operations if more than one employer enters the space at the same time, or entry is performed at the same time that any activities that could foreseeably result in a hazard in the permit space are performed. Sufficient coordination shall occur so that there is only one entry permit covering all employers. Multiple entry permits into the same space shall not be used.

11.5 After contractor entry operations, CAP and the controlling contractor must debrief all contractors who entered the space regarding any hazards confronted or created within the space.

ATTACHMENT A

CONFINED SPACE CLASSIFICATION FORM AND PERMIT

Central Arizona Project
Confined Space Entry Form

Form to be posted at job site during all entry activities

Date Entered _____

Entry Number _____ Work Order _____

Entered By _____ Work Order _____

General Information

Space to be entered: test Purpose of entry: test

Location of space entry point: _____ Duration: Date: _____ to _____

Time: _____ to _____

CONFINED SPACE HAZARDS (initial hazards present)

- ☐ Flammable/Combustible Gases or Vapors
- ☐ Combustible/Abrasive Dusts or Welding Fumes
- ☐ Toxic Gases or Vapors
- ☐ Fall Hazards
- ☐ Mechanical/Electrical Hazards
- ☐ Inadequate Illumination
- ☐ Contaminants from Adjacent Areas
- ☐ Engulfment/Impingement Hazards
- ☐ Other _____
- ☐ No Hazards Found

HAZARD CONTROL PROCEDURES (Attendant/Entrant)

_____

_____

_____

_____

_____

_____

_____

_____

_____

☐ No Controls Needed

AIR MONITOR TYPE/MODEL _____ SERIAL NUMBER _____ CALIBRATION DATE _____

PRE-ENTRY RESULTS	O2 (min.)	O2 (max.)	Combustible	H2S	CO	Other	Initials

☐ Continuous air monitoring was conducted during entry into this non-permit space. _____(initials)

EQUIPMENT REQUIRED FOR ENTRY: (check all that apply)

- ☐ Retrieval equipment
- ☐ First aid kit / AED
- ☐ Harness
- ☐ Fire extinguishers No. _____ each
- ☐ Other: _____

Communications

- ☐ Voice
- ☐ Radios
- ☐ Phones

Respirators

- ☐ 1/2 face APR
- ☐ Full face APR
- ☐ Full face Airline
- ☐ PAPR

Protective Equipment Items

- ☐ Hard hats
- ☐ Gloves
- ☐ Boots
- ☐ Face shield
- ☐ Aux. Lighting
- ☐ Coveralls
- ☐ Hearing Protection
- ☐ Goggles
- ☐ Blast Hood

AUTHORIZATION TO RECLASSIFY TO NON-PERMIT. I have reviewed the above information and can verify that this confined space is safe to reclassify to a Non-Permitted Confined Space Entry situation.

Entry Coordinator ▼

Signature Entry Coordinator

Central Arizona Project

Confined Space Entry Form

Form to be posted at job site during all entry activities

Work Order _____

Entry Number _____

Work Order _____

PRE-ENTRY PREPARATION (check after completed)

- ☐ Notification of affected departments/services
- ☐ Contractors notified of permit conditions/hazards

Isolation Methods:

- ☐ Barriers/Signs ☐ Check Gates
- ☐ Stop Logs ☐ Discharge Valve Closed
- ☐ Other _____

EMERGENCY/RESPONSE

- ☐ Non-entry Retrieval (explain)

_____

_____

- ☐ On-Site Rescue (name & phone)

_____

_____

AUTHORIZED ENTRANT(S) (Name and Employee #)

1. Select One	6. Select One	1. Select One
2. Select One	7. Select One	2. Select One
3. Select One	8. Select One	3. Select One
4. Select One	9. Select One	4. Select One
5. Select One	10. Select One	5. Select One

AUTHORIZED ATTENDANT(S)

Reporting Employee / Entry Coordinator

Signature Reporting Employee

Signature Reporting Employee

AUTHORIZATION OF ENTRY SUPERVISOR. I have reviewed the above information and have verified that these confined space entry conditions are accurately represented in this entry permit.

Authorized Supervisors

Select One

Comments

Max Chars

Permit is to be kept on-site during all authorized entries. After completing of the work, the permit is marked "CLOSED" by the Entry Supervisor and the closed permit is submitted to Maintenance Control with the work packet.

Central Arizona Project
Confined Space Entry Form

Form to be posted at job site during all entry activities

Entry Number _____

Work Order _____

Work Order _____

ADDITIONAL MONITORING EQUIPMENT

TYPE & MODEL	SERIAL NUMBER	CALIBRATION DATE

SUPLEMENTAL ENTRY/COMMUNICATION/AIR MONITORING LOG

Confined Space Employee Log

Employee	Time In	Time Out	Time In	Time Out

Communication Log

Time	Time	Time

AIR MONITORING RESULTS/TIMES

	Time Air Monitoring Conducted/Noted								
	Date								
Condition Monitored	Acceptable Conditions	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM
O2 (min.)	>19.5%								
O2 (max.)	<23%								
Flammability	<10% LEL								
H2S	<5 ppm								
CO	<25 ppm								
Tester's Initials									

	Time Air Monitoring Conducted/Noted								
	Date								
Condition Monitored	Acceptable Conditions	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM
O2 (min.)	>19.5%								
O2 (max.)	<23%								
Flammability	<10% LEL								
H2S	<5 ppm								
CO	<25 ppm								
Tester's Initials									

Permit is to be kept on-site during all authorized entries. After completing of the work, the permit is marked "CLOSED" by the Entry Supervisor and the closed permit is submitted to Maintenance Control with the work packet.

ATTACHMENT B

GENERAL INVENTORY OF CONFINED SPACES AT CAP

CANAL	Float Wells
	Turnouts
	Meter vaults
	Manholes
	Siphon access manways
	Blowoff vaults
	Siphons
PUMPING PLANTS	Oil tanks
	Sump Pits
	Air receiver tanks
	Suction Side manways
	Discharge Tube manways
	Water storage tanks
	Motor Brake air tanks
	Air-handling units
	Transducer Vaults
	Diesel fuel tanks
	Cable chases
	Surge tanks
	Drain valve vaults
	Flow control vaults
HEADQUARTERS	Gasoline fuel tanks
	Sewer system manholes
	Air pollution control devices
	HVAC fan cabinets

Central Arizona Project
Diving Requirements
March 1, 2016

This document summarizes the requirements for diving operations conducted by contractors on behalf of CAP on CAP property. It is to be provided to the Contractor upon signing of the contract and for each diving activity that the Contractor is called upon to perform. This document covers the following: General Requirements for All Diving Operations; Surface-Supplied Air Diving; and Scuba Diving. In addition to this list of diving requirements, this document includes an appendix for the Dive Plan and Hazard Analysis required for each diving activity.

I. General Requirements for All Diving Operations

A. General Requirements. Conventional hardhat and lightweight surface-supplied and scuba diving operations must conform to the more stringent requirements of this document or to 29 CFR 1910, Subpart T, "Commercial Diving Operations." If an issue or item is not addressed in these requirements, look to the regulations contained in the U.S. Navy Diving Manual, volumes I through V, for guidance.

B. Hazard Control Measures. Diving equipment may be brought to the worksite only after a diving plan and dive hazard analysis have been developed by the dive supervisor and reviewed by CAP. The dive hazard analysis and diving plan must specifically address safety procedures for each separate diving location or mode and include procedures that ensure compliance with these and referenced standards. If conditions change, all diving operations are to cease until conditions are reevaluated and appropriate controls have been implemented. Minimum requirements for the dive plan and dive hazard analysis are included in the appendix to this document. A Safe Practices Manual must be kept at the dive site.

C. Diver qualifications. Divers must not take part in diving operations if they have colds, sinus or ear infections, alcohol or drug intoxication or its aftereffects, fatigue, acute illness or vertigo, or any other medical condition that may impair his/her ability to safely perform a dive operation. Divers performing work for CAP, including those on stand-by, must have a certificate of training from a recognized diving school. A diver may dive to depths greater than 100 feet seawater equivalent only if they have previous experience diving to the maximum depth required in the planned dive. Divers must be at least 18 years old and be fully familiar with the equipment, diving system and emergency procedures to be used. Divers must have a medical evaluation within the 12 months previous to the dive certifying that the diver is physically fit for diving. All dive team members must be trained in CPR, first aid (American Red Cross standard course, or equivalent), and oxygen first aid. Prior to mobilizing on site

and commencing diving operations, the dive supervisor must submit to CAP for review satisfactory evidence that all dive team members have met the above requirements. Note: CPR courses must include hands-on training. Online training, by itself, is unacceptable.

D. Supervision. A designated, experienced, onsite dive supervisor must personally supervise all diving operations.

E. Equipment. Use a tagging or logging system to record equipment modification, repair, testing, calibration, or maintenance services. Include the date and type of work performed and the name or initials of the person who did the work.

a. Air Compressor System. Compressors that supply air to the surface-supplied air (SSA) diver must have a volume cylinder with a check valve on the inlet side, a pressure gauge, a relief valve, a drain valve, and a carbon monoxide filter and alarm system. Compressors must have the capacity to overcome any line loss or other losses and deliver a minimum of 4.5 cubic feet per minute to each diver at the maximum working depth. Air compressor intakes must be located away from areas containing exhaust or other contaminants. Respirable air supplied to a diver, or to air tanks, must not contain:

1. Carbon monoxide (CO) greater than 10 parts per million (ppm).
2. Carbon dioxide (CO_2) greater than 1,000 ppm.
3. Oil mist greater than 5 milligrams per cubic meter.
4. A noxious or pronounced odor.

Test the air compressor system output for air purity at least every six (6) months, by taking samples at the connection to the distribution system.

b. Compressed Gas Cylinders. Compressed gas cylinders must:

1. Be designed and maintained according to the applicable provisions of 29 CFR 1910.101(a).

2. Be stored in a ventilated area and protected from excessive heat.

3. Be secured against falling.

4. Have shutoff valves recessed into the cylinder or protected by a cap, except when in use, when manifolded, or when used for diving.

F. Accident reporting. Any accident which results in injury or property damage must be immediately reported to the dive supervisor and CAP. A detailed, written report of all such incidents addressing the causal factors and appropriate

prevention strategies must be submitted to the CAP within seven calendar days of the incident.

II. Surface-Supplied Air Diving

A. Auxiliary Air Supply. An auxiliary air supply must be provided during all dives. The auxiliary air supply must have a standby compressor or air flasks with a capacity of 72 cubic feet or more. Compressors that are used for diving operations must not be used for any other purpose. Auxiliary air supply must meet the requirements in the subsection, "Air Compressor System."

B. Decompression. A recognized decompression specialist must prepare decompression tables. Post decompression times inside and outside decompression chambers.

C. Decompression Chamber. The following circumstances require an onsite, dual-lock, multiplace decompression chamber (capable of recompressing the diver to a minimum of 165 feet seawater equivalent) and trained operating personnel:

- Diving operations that are outside the no-decompression limits or to depths greater than 100 feet seawater

- When surface recompressing capabilities are recommended by the decompression specialists, Dive Supervisor, or where necessitated by onsite conditions.

Decompression chambers must accommodate at least two persons.

D. Decompression Dives. Divers engaged in dives outside no-decompression limits or engaged in mixed-gas diving must remain awake and close to an attended decompression chamber for at least one hour following the dive. The diver must be able to contact a decompression chamber facility during the 4-hour period immediately following treatment or after leaving the water.

E. Communications. All divers and standby divers must be equipped with communication systems that permit simultaneous, two-way conversations between the diver, his tender, other divers and tenders, and the dive supervisor. Communication systems must be operable from the time the diver puts on his helmet or mask until it is removed.

F. Minimum Crew Size. Two divers must be available for all diving operations. The standby diver must be available, suited up, and ready to dive in an emergency. The standby diver must not serve as a tender. The minimum crew must consist of at least four persons: the dive supervisor, a diver, a standby

diver, and a tender. For each diver added to the crew, one tender must also be added.

G. Reserve Breather Gas Supply. Each diver using lightweight SSA must carry a reserve breather gas tank. When heavy, deep-sea diving gear is used, when diving to depths exceeding 100 feet of seawater, or when diving outside the no-decompression limits, the standby diver must have an extra breathing gas hose for the working diver.

III. Scuba Diving

A. Requirement. Scuba diving is permitted only when sanctioned by the contract specifications and authorized in writing by CAP.

B. Maximum Depths. Limit scuba diving to depths and times that will not require decompression staging as set forth in the U.S. Navy Standard Air Decompression Tables. Scuba dive depths must not exceed 100 feet of seawater after altitude adjustment.

C. Compressed Air. Oxygen or mixed gases are prohibited, except for up to 40 percent nitrox, when used in accordance with the National Oceanic and Atmospheric Administration (NOAA) Diving Manual: Diving for Science and Technology, Chapter 15, "Nitrox Diving" and Appendix VII, "Nitrox Dive Tables." Use only open circuit scuba systems.

D. Diving Equipment. A recognized approving agency must approve scuba diving equipment. Use and maintain scuba diving equipment in accordance with the manufacturer's recommendations.

E. Buddy system. A dive may be made singly if the dive is less than 20 feet deep, there is little current and visibility is good (at the discretion of the dive supervisor). All other dives with scuba gear must use a buddy system. Buddy pair divers must maintain visual contact or use a buddy line securely fastened to both divers. When working in fast currents, murky water, or in confined spaces, a tether line must be attached to the diver and it shall be continuously tended from the surface.

F. Standby Diver. A standby diver must be provided for each diver or buddy pair. The standby diver must be a qualified, fully equipped scuba diver and remain on the surface, close to the diver.

G. Standard Equipment. Scuba divers must wear buoyancy compensators and have a depth indicating device, timing device, cutting tool, flashlights, compass, submersible pressure gauge (or integrated dive computer) to monitor cylinder/system air pressure, and an alternate second stage air source, such as an octopus or safe second.

APPENDIX

Dive Plan and Hazard Analysis. Prepare a dive plan and hazard analysis before each diving activity. All personnel involved must review the dive plan and hazard analysis before suiting up. As a minimum, the plan must contain the following:

1. Names and duties of dive team members, including the dive supervisor.

2. Date, time, and location of the dive operation.

3. Diving mode to be used (scuba, surface-supplied air, etc), including a description of the backup air supply.

4. A description of the work divers will perform, and inspection requirements.

5. Surface and underwater conditions, including visibility, temperature, thermal protection, and currents.

6. Activity hazard analysis for each phase of work, including the hazards of flying after diving.

7. Maximum depth and bottom time (make altitude adjustments to dive tables for dives at altitudes of 1000 feet or more above sea level).

8. Emergency management plan, including emergency procedures, means of notification, telephone numbers for ambulance, doctors, and Divers Alert Network; locations of evacuation routes; and other emergency assistance protocols.

9. Lockout/tagout procedures, including how to deal with differential water pressures due to unequal water elevations.

10. Equipment servicing records, procedures, and checklists and requirements for special tools and equipment.

Submittals: The following information must be submitted to and approved by CAP prior to mobilizing on site:

1. The Dive Plan and Hazard Analysis

2. Evidence of training for each diver for the method of diving to be used.

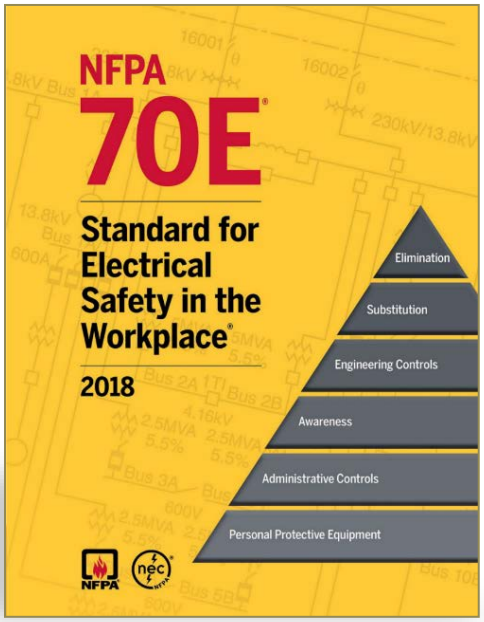
3. For dives exceeding a depth greater than 100 feet seawater equivalent, evidence that the divers have had previous experience diving to the maximum depth.

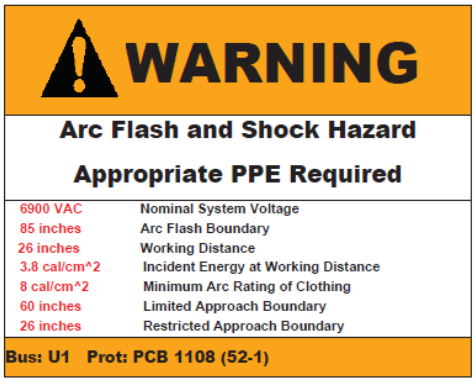
4. Evidence of medical evaluations for each diver, conducted within 12 months previous to the dive.

5. Evidence of first aid, CPR and oxygen first aid training and current certification for each dive team member

6. Insurance certificates in accordance with contract requirements.

Central Arizona Project
ELECTRICAL SAFETY PROGRAM





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1 INTRODUCTION

This program establishes minimum standards to prevent hazardous electrical exposures to personnel and ensure compliance with regulatory requirements applicable to electrical systems (OSHA 1910.331-335, 1910.269, NFPA 70E, NEC). This program is designed to ensure that energized electrical work at CAP facilities is performed safely by qualified electrical workers who are trained and provided with the appropriate safe work procedures, personal protective equipment (PPE), and other controls. This program is designed to protect employees against electrical shock, arc flash burns, and arc blast.

1.1 Scope

This program applies to all CAP facilities and work performed by its employees regardless of job site location.

All contractors providing services for CAP shall have their own Electrical Safety Program that is equal to CAP's or adopt CAPs program for their own usage.

1.2 Purpose

To implement and document an overall safety program that directs activity appropriate for the voltage, energy level, and circuit conditions.

This program has been established in order to:

a) Ensure the safety of employees who may work on or near electrical equipment.
b) Ensure that employees understand and comply with adopted safety standards related to electrical work.
c) Comply with OSHA 1910, NFPA 70E, and the National Electric Code as applicable to the work performed at CAP.
d) Provide and demonstrate an electrical safety program with defined responsibilities.
e) Determine the degree of arc flash hazard encountered by CAP personnel and notification through the use of current warning labels on equipment.
f) Provide personal protective equipment (PPE) for all workers exposed to electrical hazards that is in accordance with current standards.
g) Provide documented training and notification to workers of CAP electrical safety standards.
h) Provide appropriate tools for safe work on and around electrical equipment
i) Provide a standard for which CAP will audit the program usage and determine that all users are in compliance.

2 ROLES AND RESPONSIBILITIES

2.1 Electrical Safety Committee

The Electrical Safety Committee shall audit the electrical safety program to verify the principles and procedures of the program are in compliance with the current NFPA 70E standard. The audits shall be done every 3 years, coinciding with the issuance of the latest revision of the standard. The Committee shall update the program as required within the first year of the latest NFPA 70E standard issuance. The review shall be

documented by the revision number and issue date of the program. The Committee membership shall be composed from the following positions:

a. Operational Technology Manager.
b. Safety Manager.
c. West and South Maintenance Managers.
d. Electrical Safety Program Administrator
e. Electrical Reliability Engineering Supervisor
f. Electrical Systems Engineering Supervisor

2.2 Electrical Safety Program Administrator

a. Evaluate work being performed and determine compliance with this program.
b. Provide electrical training specified in this program.

2.3 Safety Department

a. Evaluate the overall effectiveness of the electrical safety program.
b. Training recordkeeping.
c. Provide or coordinate general training for CPR/AED requirements of this Program.
d. Review and approve Contractor safety programs.

2.4 Supervisors

a. Promote electrical safety awareness to all employees.
b. Ensure employees comply with ALL provisions of the electrical safety program.
c. Evaluate employees' compliance with this program, and their skills and knowledge appropriate to their assigned electrical tasks.
d. Ensure employees are provided with and use appropriate protective equipment.
e. Ensure job briefings are performed prior to work execution.

2.5 Employees

a. Comply with work practices described in this document, including the use of appropriate protective equipment and tools.
b. Attend all training required relative to this program.
c. Immediately report any concerns related to electrical safety to supervision.

2.6 Engineering (Systems and Reliability)

a. Complete arc flash analyses required by this program as needed and during equipment replacement or upgrading.
b. Emphasize controlling electrical hazards through the application of engineering and design controls.
c. Promote consistency in how electrical tasks are completed within the various facilities.
d. Assure newly installed or modified electrical equipment and systems comply with applicable codes and standards prior to being placed into service.

2.7 Training Adminstrator

a. Maintains list of qualified electrical workers.
b. Maintains records of training required by this program.

3 DEFINITIONS

Arc Flash Hazard. A source of possible injury or damage to health associated with the release of energy caused by an electric arc.

Arc Flash Suit. A complete arc-rated clothing and equipment system that covers the entire body, except for the hands and feet.

Arc Rated Clothing. Arc Rated (AR) clothing or equipment indicates that it has been tested for exposure to an electric arc. Flame Resistant (FR) clothing without an arc rating has not been tested for exposure to an electric arc. All arc-rated clothing is also flame-resistant.

Area Supervisor. A maintenance supervisor who is the asset owner of the equipment and systems in his area of responsibility.

Authorized Lockout/Tagout Employee. A person who has completed the required hazardous energy control training and is authorized to lockout or tagout a specific machine or equipment to perform service or maintenance. A person must have knowledge of the equipment and systems within his/her area of responsibility and be approved by their supervisor and the area supervisor as an Authorized Lockout/Tagout Employee in order to apply a lock or tag to control hazardous energy. All Authorized Lockout/Tagout Employees must be trained in:

- Electrical Safety Program / NFPA 70E.
- Hazardous Energy Control Program.
- Equipment specific procedures (SECP's) in their assigned work areas.

Barricade. A physical obstruction such as tapes, cones, or A-frame type wood or metal structures intended to provide a warning and to limit access.

Barrier. A physical obstruction that is intended to prevent contact with equipment or energized electrical conductors and circuit parts or to prevent unauthorized access to a work area.

Boundary, Arc Flash. When an arc flash hazard exists, an approach limit at a distance from a prospective arc source within which a person could receive a second degree burn if an electrical arc flash were to occur. The boundary is the distance from the arc source where the incident energy is 1.2 cal/cm^2.

Boundary, Limited Approach. An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists. Unqualified personnel may not cross this boundary.

Boundary, Restricted Approach. An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased likelihood of electric shock, due to electrical arc-over combined with inadvertent movement. Insulated tools and PPE are required inside the restricted approach boundary.

CAP Minimum Arc-Rated (AR) Clothing. CAP provides arc-rated shirts and pants to Qualified Electrical Workers, who are to wear the clothing anytime they are in a facility or site with energized electrical equipment.

De-energized. Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth. De-energized does not describe an electrically safe work condition; e.g. a circuit that has been disconnected but not controlled and verified.

Disconnecting (or Isolating) switch. A mechanical switching device used for isolating a circuit or equipment from a source of power.

Electrical Hazard. A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn or arc blast injury.

Electrically Safe Work Condition. A state in which the conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with the Hazardous Energy Control Program, tested to verify the absence of voltage, and if necessary, temporarily grounded for personnel protection.

Energized. Electrically connected to, or is, a source of voltage.

Energized Electrical Work. Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment (PPE) a person is wearing. There are two categories of energized electrical work: ***Diagnostic (testing)*** is taking readings of electrical equipment with approved test equipment that does not require making any permanent physical change to the equipment; ***repair*** is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.).

Energized Electrical Work Permit. A document required to perform repairs within the restricted approach boundary when it is infeasible to put the equipment into an electrically safe work condition. The work permit includes a description of the circuit and equipment, shock and arc flash risk assessments, the work to be performed, a justification for why the work must be performed in an energized condition, a job plan and job briefing, and authorization from management.

Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Exposed electrical parts. Energized parts that can be inadvertently touched or approached nearer than a safe distance by a person. Parts not suitably guarded, isolated, or insulated.

Grounded (Grounding). Connected (connecting) to ground or to a conductive body that extends the ground connection.

Grounded Conductor. A system or circuit conductor that is intentionally grounded.

Ground Fault Circuit Interrupt (GFCI). A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established for a class A device (when a fault current to ground exceeds 6mA and does not trip below 4mA).

Grounding Conductor, Equipment (EGC). The conductive path(s) that provides a ground fault current path and connects normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both.

Guarded. Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms or remove the liklihood of approach or contact by persons or objects to a point of danger.

Hazard. A source of possible injury or damage to health.

Hazardous. Involving exposure to at least one hazard.

Incident Energy. The amount of thermal energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. Incident energy is typically expressed in calories per square centimeter (cal/cm^2).

Incident Energy Analysis. A component of an arc flash risk assessment used to predict the incident energy of an arc flash for a specified set of conditions.

Interlock. An electrical, mechanical, or key-locked device intended to prevent an undesired sequence of operations.

Interrupter Switch. A switch capable of making, carrying, and interrupting specified currents.

Interrupting Rating. The highest current at rated voltage that a device is identified to interrupt under standard test conditions.

Qualified Person. One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk.

Qualified, Limited Person. A Qualified person limited to working on specific systems or equipment that is energized or potentially energized.

Risk Assessment. An overall process that identifies hazards, estimates the likelihood of occurrence of injury or damage to health, estimates the potential severity of injury or damage to health, and determines if protective measures are required.

Service Equipment. The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the entrance of supply conductors to the building and intended to constitute the main control and means of cutoff of the supply.

Service Point. The point of connection (point of demarcation) between the facilities of the serving utility and the premises wiring.

Shock Hazard. A source of possible injury or damage to health associated with current through the body caused by contact or approach to energized electrical conductors or circuit parts.

Short-Circuit Current Rating. The prospective symmetrical fault current at a nominal voltage which an apparatus or system is able to be connected without sustaining damage exceeding defined acceptance criteria.

Step Potential. A ground potential gradient difference that can cause current flow from foot to foot through the body.

Switching Device. A device designed to close, open, or both, one or more electric circuits.

Touch Potential. A ground potential gradient difference that can cause current flow from hand to hand, hand to foot, or another path, other than foot to foot, through the body.

Ungrounded. Not connected to ground or a conductive body that extends the ground connection.

Unqualified Person. A person who is not a Qualified person.

Voltage (of a circuit). The greatest root-mean-square (effective) difference of potential between any two conductors of the circuit concerned.

Voltage, nominal. An approximate value assigned to a circuit or system for the purpose of conveniently designating its voltage class, e.g., 120/240, 480/277, and 600.

4 EMPLOYEE TYPES

4.1 Qualified Electrical Workers

Qualified personnel that have successfully completed all training requirements are considered Qualified Electrical Workers. Qualified electrical workers are the only workers that are allowed to work within the Limited Approach Boundary of exposed energized electrical conductors and circuit parts operating at greater than 50 volts.

A **qualified electrical worker** is defined as one who has demonstrated skills and knowledge in the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk. Specifically the qualified electrical worker will have the following:

a) Familiarity with the proper use of special precautionary techniques, personal protective equipment including arc-flash suit, insulating and shielding materials, insulated tools and test equipment.
b) The skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment.

c) The skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts.
d) Understanding of approach distances and the corresponding voltages to which qualified persons will be exposed as specified in NFPA 70E Table 130.4(D)(a) and (b) in Appendix B of this program.
e) The decision making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.
f) Specified training to work on energized conductors or circuit parts which includes selecting an appropriate voltage detector/s to verify the absence or presence of voltage and has demonstrated that usage.
g) An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Note: *A person can be considered qualified with respect to certain equipment and methods but still be unqualified for others. For this reason, we define certain positions as Limited Qualified with the boundaries of their responsibilities defined. The following is a list of positions at CAP that are considered qualified electrical workers or limited qualified.*

4.1.1 Electrician (Plant, Meter/Relay, Headquarters, I&C)

a) Qualified electrical worker.
b) Interacts with plant, switchyard and substation equipment.
c) PPE issued CAP minimum clothing up to Arc Flash PPE Category 4 and class 0 voltage rated gloves.

4.1.2 Electrical Engineer

a) Qualified electrical worker.
b) Interacts with plant, switchyard and substation equipment.
c) PPE issued CAP minimum clothing and class 0 voltage rated gloves.

4.1.3 Communication Engineer

a) Limited qualified electrical worker.
b) Works with and on plant and communications site equipment consisting of circuits under 600 volts.
c) PPE issued CAP minimum clothing and class 0 voltage rated gloves.

4.1.4 Engineering Construction Inspector (Electrical)

a) Qualified electrical worker.
b) Interacts with plant, switchyard and substation equipment.
c) PPE issued CAP minimum clothing and class 0 voltage rated gloves.

4.1.5 HVAC and Fire ProtectionTechnician

a) Limited qualified electrical worker.
b) Works on HVAC and fire control systems consisting of circuits under 600 volts.
c) PPE issued CAP minimum clothing up to Arc Flash PPE Category 2 and class 0 voltage rated gloves.

4.1.6 Apprentice Electrician

a) Limited qualified electrical worker, who is undergoing on-the-job training.
b) PPE issued CAP minimum clothing, class 0 voltage rated gloves and additional arc flash PPE appropriate to their training level.

4.1.7 ATP Employees with Electrical Training

a) Includes supervisors, managers, planners, etc. with training and experience defined above.
b) PPE issued CAP minimum clothing and class 0 voltage rated gloves.

4.2 Unqualified Persons working on and around electrical installations

4.2.1 Unqualified Persons

a) Are not permitted closer to exposed energized conductors than the Limited Approach Boundary.
b) Are not permitted to open doors or remove panels that expose them to any voltages in excess of 50 volts.
c) Are allowed to work on or within any electrical equipment after such equipment has been placed in an Electrically Safe Work Condition.

4.2.2 Unqualified positions at CAP

a) Plant Mechanic
b) Plant Maintenance Worker
c) Overhaul Mechanic
d) Industrial Coater/Painter
e) Machinist
f) Aqueduct Maintenance Worker (all classes)
g) Universal (crane) Operators
h) Aqueduct Heavy Equipment Operator and Equipment Operator
i) Water Operators
j) Construction Inspectors (non-electrical)
k) Non-electrical ATP employees

5 TRAINING REQUIREMENTS (110.2)

5.1 General Training Requirements

All CAP employees shall be trained and be familiar with general safety procedures and electrical safety policies.

5.2 Training Requirements for Qualified Electrical Workers

5.2.1 Electrician (Plant and Headquarters)

a) NFPA 70E Arc Flash High / Low Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) High Voltage Switchman Training (once each location, retrain if moved to different location).
d) CPR/AED Training every 2 years.

5.2.2 Electrician (Relay and I&C and Apprentices)

a) NFPA 70E Arc Flash High / Low Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 2 years

5.2.3 Technician (HVAC, Fire Protection)

a) NFPA 70E Arc Flash Low Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 2 years.

5.2.4 Engineering Construction Inspector and Technician (Electrical)

a) NFPA 70E Arc Flash Low / High Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 2 years.

5.2.5 Communication Engineer

a) NFPA 70E Arc Flash Low Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 2 years.

5.2.6 Electrical Engineer

a) NFPA 70E Arc Flash Low / High Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Affected, retrain every 3 years).
c) CPR/AED Training every 2 years

5.2.7 Supervisors (Qualified Electrical or Pumping Plant)

a) NFPA 70E Arc Flash High / Low Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 2 years.

5.2.8 Managers (Staff interacts with electrical equipment)

a) NFPA 70E Arc Flash High / Low Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Affected, retrain every 3 years).
c) CPR/AED Training every 2 years.

5.3 Training Requirements for Electrically Unqualified Workers

5.3.1 Work in and around electrical installations

5.3.1.1 Mechanic (Plant, Overhaul, Machinist, Apprentice)

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 3 years.

5.3.1.2 Plant Maintenance Workers

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 3 years.

5.3.1.3 Universal Operators (Crane Operators)

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Electrical Safety Program Overview (HECP affected,retrain every 3 years)

c) CPR/AED Training every 3 years.

5.3.1.4 Aqueduct Maintenance Worker (All Classes)

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Electrical Safety Program Overview (HECP affected,retrain every 3 years)
c) CPR/AED Training every 3 years.

5.3.1.5 Aqueduct Heavy Equipment Operator and Equipment Operator

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Electrical Safety Program Overview (HECP affected,retrain every 3 years)
c) CPR/AED Training every 3 years.

5.3.1.6 Industrial Coater / Painter

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Electrical Safety Program Overview (HECP affected,retrain every 3 years)
c) CPR/AED Training every 3 years.

5.3.1.7 Non-Electrical Supervisors and Managers with Staff that do not work around electrical installations

a) NFPA 70E Unqualified Training (retrain every 3 years).
b) Electrical Safety Program Overview (HECP affected,retrain every 3 years)
c) CPR/AED Training every 3 years.

5.3.1.8 Construction Inspectors (non-electrical)

a) NFPA 70E Arc Flash Low / High Voltage Training (retrain every 3 years).
b) Hazardous Energy Control Program (Authorized, retrain every 3 years).
c) CPR/AED Training every 3 years.

5.3.2 Workers whose job does not expose them to regular electrical hazards.

1) Electrical Safety General Awareness (one time, new employee orientation).
2) Electrical Safety Program Overview (HECP affected, retrain every 3 years)
3) CPR/AED Training every 3 years.

5.4 Retraining

Retraining in safety-related work practices and applicable changes to this program shall be performed at intervals not to exceed 3 years. An employee shall receive additional training or retraining under any of the following conditions:

a) If the supervision or annual inspections indicate that the employee is not complying with the safety-related work practices.
b) If new technology, new types of equipment, or changes in procedures necessitate the use of safety-related work practices that are different from those that the employee would normally use.
c) If the employee must employ safety-related work practices that are not normally used during his or her regular job duties.
d) The employee's job duties change.

Note: *Employees that have not performed the specific tasks required of a Qualified Electrical Worker for more than one year will require retraining before the performance of the work practice involved.*

6 ELECTRICAL SAFETY AUDITING (110.1(K))

6.1 Electrical Safety Program

The electrical safety program shall be audited by the Electrical Safety Committee to verify the principles and procedures of the program are in compliance with the current NFPA 70E standard. The audits shall be done every 3 years, coinciding with the issuance of the latest revision of the standard. The program will be updated as required within the first year of the latest NFPA 70E standard issuance. The review shall be documented on the revision number and issue date of the program.

6.2 Field Work

Field work audits are performed by field supervisors annually as part of the Qualified Electrical Worker's performance evaluation. Compliance with this program is a required competency for those employees, and is documented on their annual performance evaluation.

6.3 Hazardous Energy Control Program

The hazardous energy control program (LO/TO) is audited annually by the Electrical Safety Administrators to verify the principles and procedures of the program are in compliance with the current NFPA 70E standard. The audit covers at least one lockout / tagout procedure in progress and is documented to identify and correct deficiencies in the procedures and training.

6.4 Incident Investigations (110.1(J))

Electrical incidents include events or occurrences that result in, or could have resulted in, a fatality, an injury, or damage to health. Such incidents will be investigated to identify causes contributing to the incident. Causes shall be addressed to prevent re-occurrance. Incidents that do not result in fatality, an injury, or damage to health are commonly referred to as "close call" or "near miss". Close Call Report Form

7 RISK ASSESSMENT CONSIDERATIONS FOR ENERGIZED WORK (110.1(H))

A risk assessment uses the information in the Arc Flash Hazard Analysis Report as related to the tasks to be performed. If an electrical hazard exists, the risk assessment includes a procedure to carry out the following:

a) Identify hazards.
b) Assess risks.
c) Implement risk control strategies utilizing the hierarchy of controls listed in 7.4.

7.1 Hazard Identification

a) A job hazard analysis must identify the electrical hazards associated with each energized electrical task to be performed.
b) The equipment electrical hazard label should be referenced to identify potential incident energy exposure for each task associated with an arc flash hazard. If the incident energy has not been analyzed, refer to Appendix D for arc flash hazard information.
c) Either the equipment electrical hazard label or Appendix B should be referenced to identify shock hazards.

7.2 Risk Assessment

a) For tasks identified with arc flash hazards, refer to Appendix E to assess the likelihood of an arc flash incident and the equipment electrical hazard label or Appendix D to assess the severity of incident energy exposure.
b) For tasks identified with shock hazards, determine which approach boundaries will be crossed, if any.

7.3 Human Error

Tasks should be evaluated for the potential for human error and the negative consequences on people, processes, the work environment, and equipment. Human performance addresses managing human error as a unique control that is complementary to the hierarchy of risk control methods.

7.4 Risk Control Strategies

Control strategies must be considered and documented in descending order of effectiveness to reduce hazards to the maximum extent possible. The purpose of these controls is to either reduce the likelihood of an incident occurring or to prevent or mitigate the severity of consequence if an incident occurs. No control is infallible. All of the controls are subject to errors in human performance, whether at the design, implementation, or use phase.

7.4.1 Elimination

De-energizing and establishing an electrically safe work condition is the ideal method of eliminating injuries due to shock or arc flash hazards. By following hazardous energy controls, the risks have been eliminated and the potential inherent electrical hazards have been effectively eliminated. It should be noted that the hazard elimination process, e.g. placing the equipment in an electrically safe work condition, could require interaction with energized equipment and the hazards can only be considered eliminated once the electrically safe work condition is established.

7.4.2 Substitution

Replacing equipment or changing procedures and processes may effectively eliminate or reduce the hazards to a tolerable level of risk or to a lower risk where a combination of controls can be implemented to reduce the risk and potential hazards to the employee.

7.4.3 Engineering Controls

(1) Modifying or adding protection controls such as the use of zone selective interlocking.
(2) Replacing older breakers with breakers that have adjustable trip elements.
(3) Differential relaying.
(4) Energy-reducing maintenance switch systems.
(5) Energy-reducing active arc flash mitigation systems.
(6) Arc flash relay.
(7) High-resistance grounding coils.
(8) Current-limiting devices.

7.4.4 Awareness

The use of warning labels, signs, equipment labeling, and alerting techniques. (NFPA 70E Art. 120, 130.5(D) and 130.7(E)).

7.4.5 Administrative Controls

(1) Emergency procedures.
(2) Employee training.
(3) Risk assessment.
(4) Pre-Job briefing.
(5) Increasing working distances (including remote racking and operating).
(6) Reviewing Lockout/tagout procedures.
(7) Use of Energized Electrical Work Permits.
(8) Approach boundaries.
(9) Arc flash boundaries.
(10) Arc Flash Hazard Analysis Report.

7.4.6 PPE

(1) Considered the least effective of the safety controls.
(2) Last line of defense before an event happens.
(3) Properly arc rated (AR) for the exposure.
(4) Most appropriate PPE for the tasks to be performed determined and used.
(5) Adequately maintained and inspected.
(6) Does not protect against hazards such as concussion, flying debris, or foreign objects.

8 JOB SAFETY PLANNING AND PRE-JOB BRIEFING (110.1(I))

Before starting each job that involves exposure to electrical hazards, the employee in charge shall complete a job safety plan and conduct a job briefing with the employees involved. If working alone, no job briefing is required.

8.1 Job Safety Planning

The job safety plan shall be in accordance with the following:

a) Be completed by a Qualified Electrical Worker.
b) Be documented using the Job Hazard Analysis/Pre-Job Brief form.
c) Include the following information:
   1. Description of the job and individual tasks.
   2. Identification of the electrical hazards associated with each task.
   3. A shock risk assessment in accordance with NFPA 70E 130.4 for tasks involving a shock hazard. Refer to Appendix B for shock boundaries.
   4. An arc flash risk assessment in accordance with NFPA 70E 130.5 for tasks involving an arc flash hazard. Refer to Appendix E for arc flash incident likelihood and the electrical hazard label for arc flash severity.
   5. Work procedures involved, special precautions, and energy source controls.

8.2 Pre-Job Briefing

The job briefing shall cover the job safety plan and the information on the energized electrical work permit, if a permit is required. If the work or operations to be performed

during the work day or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of the day or shift.

8.3 Change in Scope

Additional job safety planning and job briefings shall be held if changes occur during the course of the work that might affect the safety of employees.

9 ESTABLISHING AN ELECTRICALLY SAFE WORK CONDITION (120)

Establishing an electrically safe work condition is the preferred method for working on electrical equipment or circuit parts. An electrically safe work condition is a state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with Hazardous Energy Control Program, tested to verify the absence of voltage, and, if necessary, temporarily grounded for personnel protection. It should be noted that de-energizing an electrical conductor or circuit part and making it safe to work on is, in itself, a potentially hazardous task.

9.1 Establishing an electrically safe work condition includes:

a) Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.
b) After performing a normal shutdown on the load equipment, open the disconnecting device(s) for each source.
c) Visually verify that all blades of the disconnecting devices are fully open or that drawout-type circuit breakers are withdrawn to the fully disconnected position.
d) Apply lockout/tagout devices in accordance with the CAP Hazardous Energy Control Program .
e) Use an adequately rated voltage detector to test each phase conductor or circuit part to verify that they are de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily.
f) If exposed normally current-carrying parts on equipment having a nominal voltage rating over 600 volts are to be contacted or approached within the restricted approach boundary, personal protective grounding shall be applied.

9.2 Personal Protective Grounding Installation

The primary purpose of personal protective grounding is to provide adequate protection against electrical shock causing death or injury to personnel working on deenergized lines or equipment. This is accomplished by grounding and bonding lines and equipment to limit the body contact or exposure voltages at the worksite to a safe value until protective relays can operate to isolate the source of energy if the lines or equipment are accidentally energized. Refer to USBR FIST 5-1 for more information.

a) Personal protective grounding is required when approaching nearer than the restricted approach boundary for equipment rated 600V and above.
b) The shock hazard remains until PPG are applied to the circuit for equipment rated 600V and above. Use live-line tools to apply grounds.
c) In applying grounds, care must be exercised to stay clear of the grounding cables. The practice of holding the cable near the base of the hot stick to lighten the load on the head of the stick is strictly prohibited. A co-worker should assist in applying heavy grounds by holding the cable with another hot stick, or by using a

shepherd hook with a pulley and nonconductive rope to hoist the ground cable into position.

d) Grounds are placed on circuits or conductors that have been disconnected from energized parts and locked/tagged as described in the HECP manual.
e) Grounds are connected directly to the equipment, bus, or conductor to be grounded. No impedance or device (circuit breaker, disconnect switch, transformer, line trap, etc.) shall be permitted in series between the point of connection of the protective grounds and location of contact by the workers.
f) Ground cable assemblies shall be visually and mechanically inspected before each use.
g) The clamp jaws should be wire brushed immediately before attachment, and the surface of the object to be clamped should be cleaned before the clamp is attached. De-energized conductors must be cleaned with a wire brush attached to a hot stick.
h) Ground end clamps are applied first to a grounding point as close as practical to the location where workers are likely to simultaneously contact grounded objects (metal equipment enclosures, circuit breaker and transformer tanks, etc.) and exposed parts of temporary grounded equipment at the worksite.
i) Circuit-end or the working end clamps of ground cable assemblies shall be applied after the ground-end clamps are connected. The circuit or working end clamps shall always be connected and disconnected by means of hot sticks of adequate length to stay outside of the restricted approach boundary. If feasible, use a hotstick of sufficient length to remain outside the arc flash boundary also, so that no additional arc flash PPE will be needed.
j) Slack in installed cables should also be minimal to reduce possible cable failure or injury to workers due to whipping action from fault currents.
k) Placement of personal protective grounds is documented on the clearance form and by Water Operations.

Precautions to consider when placing grounds:

l) Placing grounds on the wrong equipment and other human errors create deadly consequences.
m) Exposed equipment that is not locked/tagged per HECP may be present in the work area and could be contacted by grounds, tools or body parts creating deadly consequences.

10 INTERACTION WITH ENERGIZED ELECTRICAL EQUIPMENT (130.2(A))

Interaction is defined as affecting or changing the state or condition of energized electrical equipment or circuits.

10.1 Equipment Operating at Less Than 50 Volts

Energized electrical conductors and circuit parts that operate at less than 50 volts shall not be required to be de-energized where the capacity of the source and any overcurrent protection between the energy source and the worker are considered and it is determined that there will be no increased exposure to electrical burns or to explosion due to electric arcs.

10.2 Normal Operation

Normal operation of electric equipment shall be permitted where a normal operating condition exists. A normal operating condition exists when all of the following conditions are satisfied:

a) Equipment is properly installed.
b) Equipment is properly maintained.
c) Equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer's instructions.
d) Equipment doors are closed and secured or open as required by the equipment design for the operation being performed.
e) All equipment covers are in place and secured.
f) There is no evidence of impending failure.
g) All protection devices, protective relays, and trip elements protecting the equipment or device have been properly maintained.

10.3 Energized Electrical Work Permit

10.3.1 When Required

When work is performed as permitted, an energized electrical work permit shall be required and documented under any of the following conditions:

a) When work is performed within the restricted approach boundary.
b) When the employee interacts with the equipment when conductors or circuit parts are not exposed, but an increased likelihood of injury from an exposure to an arc flash hazard exists.
c) When it is determined that de-energizing introduces additional hazards or increased risk.
d) When it is determined that de-energizing is infeasible due to equipment design or operational limitations.

10.3.2 When Work Permit is Not Required

Electrical work shall be permitted without an energized electrical work permit if a qualified electrical worker is provided with and uses appropriate safe work practices and PPE in accordance with the following conditions:

a) Testing, troubleshooting or voltage measuring.
b) Lifting wires to isolate portions of plant control circuits as defined in 10.3.3.
c) Thermography, ultrasound, or visual inspections if the restricted approach boundary is not crossed.
d) Access to and egress from an area with energized electrical equipment if no electrical work is performed and the restricted approach boundary is not crossed.
e) General housekeeping and miscellaneous non-electrical tasks if the restricted approach boundary is not crossed.

10.3.3 Working behind (downstream) of lifted wires or conductors

Occasions may arise where it may be necessary to isolate a portion of a plant control circuit without taking the entire circuit out of service. This only involves circuits of 125VDC, 120VAC or less. Most common is the situation where the protection circuit of equipment must be kept energized as in a protective relay scheme but a device must be removed or re-wired.

a) Lift the wire(s) to isolate the portion of the circuit to be worked on.

b) Assure the lifted wires are insulated to prevent inadvertent contact with energized circuits.
c) Tag each one with a Lifted Wire tag.
d) Document in the plant green log book or create a lifted wire list in the work package.

11 EQUIPMENT LABELING AND ARC FLASH HAZARD ANALYSIS (130.5)

11.1 Electrical Hazard Warning Labels

CAP will label all electrical equipment enclosures that will indicate the electrical hazards that may be encountered when accessing the equipment. Refer to Appendix A for examples. Any equipment that has not had an incident energy analysis performed and does not have an electrical hazard label, refer to Appendix B for shock hazard and Appendix D for arc flash hazard information. There are three groups of information on the electrical hazard warning labels:

11.1.1 Arc Flash Hazards

An incident energy analysis will be performed that determines the incident energy a person could potentially be exposed to when performing work on the energized equipment. The label will indicate the following information related to arc flash hazards:

a) Arc flash boundary.
b) Working distance.
c) Incident energy at the working distance.
d) Minimum arc rating of clothing up to 40 cal/cm^2 for Warning labels. Where the incident energy is above 40 cal/cm^2, the label will indicate Danger and N/A for the minimum arc rating of clothing. Equipment with a Danger label must not be accessed until de-energized.

11.1.2 Shock Hazards

The label will indicate the following information related to shock hazards:

a) Nominal system voltage.
b) Limited approach boundary.
c) Restricted approach boundary.

11.1.3 General Information

The label will indicate the following general information:

a) Panel or equipment designation.
b) Upstream protective device that interrupts the fault and/or isolates the equipment.

11.2 Incident Energy Analysis

The Incident Energy Analysis determines the severity of potential arc flash hazards by identifying the arc flash boundary, the incident energy at the minimum working distance, and the required PPE to be used within an arc flash boundary. This analysis provides the information and tools that can be used to reduce the potential incident energy exposure. The assumptions, calculations, methodology, findings, and recommendations made while performing the Incident Energy Analysis of these circuits must be documented in the facility Arc Flash Hazard Analysis Report. The

Incident Energy Analysis must be performed in tandem with an equipment duty evaluation and a protective device coordination study.

12 GENERAL SAFE WORK PRACTICES (130.6)

12.1 Employee Working Alone

a) An employee working alone need not conduct a job briefing. However, the employee shall complete the JHA / PJB form and ensure that the tasks to be performed are reviewed as if a job briefing were required.
b) Routine high voltage switching of circuits does not require two employees be present.
c) Employees may request a second qualified person be present if the work is particularly hazardous or complicated.

12.2 Alertness

a) Employees are to remain alert at all times while working within the Limited Approach Boundary of any energized equipment or in situations where any electrical hazards may exist.
b) Employees that are impaired shall not be permitted to work within the Limited Approach Boundary of any energized equipment. Impairment may be due to illness, fatigue, prescription drug use, or any other reasons.
c) Changes in scope or plan of a job or task that may impose hazards to the work that were not originally planned for require an additional "on the spot" job briefing with all employees involved in the work. If these hazards cannot be worked safely then the work shall stop until a new plan can be initiated.
d) Employees are not to reach blindly into areas that may contain exposed energized conductors or where an electrical hazard may exist.
e) Employees working on electrical equipment are to remain alert of others that may enter the area and keep all unqualified individuals out of the Limited Approach Boundary.

12.3 Illumination

a) Employees shall not enter spaces containing electrical hazards unless illumination is provided that enables the employee to perform the work safely. This illumination may be in the form of hand held lights or portable work lights.
b) Where lack of illumination or an obstruction precludes observation of the work to be performed, employees shall not perform any task within the Limited Approach Boundary.

12.4 Conductive Articles Being Worn

a) Conductive articles of jewelry and clothing (watchbands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive threads, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with energized conductors or circuit parts.
b) Over glasses made of insulated materials may be worn over wire frame prescription glasses and are stocked in the CAP warehouse.
c) Face shields made of non-conductive materials may be worn over wire frame prescription glasses and are stocked in the CAP warehouse.

12.5 Conductive Materials, Tools, and Equipment Handling

a) Conductive materials that are in contact with any part of an employee's body shall be handled in a manner that prevents accidental contact with energized conductors. Such materials include but are not limited to pipes, tubing, conduits, metal tape measures, scaffold parts, ladders, fish tapes, and conductive hoses.
b) When approaching or working around energized electrical conductors while carrying or handling conductive materials special precautions must be taken to prevent the conductive material from coming within the Restricted Approach Boundary.

12.6 Doors and Hinged Panels

Doors, hinged panels, and similar installations shall be secured to prevent them from swinging into an employee and causing the employee to contact exposed energized electrical conductors or circuit parts operating at voltages of 50 volts or greater. While working in panels with hinged doors with energized conductors, the workers body shall be protected from the conductors with insulating shields or blankets.

12.7 Housekeeping Duties Around Energized Equipment

Employees shall not perform housekeeping duties around energized equipment if there is a possibility of contact or coming within the Limited Approach Boundary, unless adequate safeguards such as insulating blankets or barriers are installed to prevent contact. Electrically conductive cleaning materials such as steel wool and metal brushes shall not be used within the Limited Approach Boundary unless procedures to prevent electrical contact are followed.

12.8 Anticipating Failure

When there is evidence that electrical equipment could fail and injure employees or damage equipment, the electrical equipment shall be de-energized unless de-energizing will introduce additional hazards or increased risk or is infeasible because of equipment design or operational limitations. Until the equipment is de-energized or repaired, employees shall be protected from hazards associated with the impending failure of the equipment by suitable barricades and other alerting techniques necessary for safety of the employees.

12.9 Routine Opening and Closing of Circuits

Load-rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for opening, reversing, and closing of circuits under load conditions. Cable connectors not of load-break type, fuses, terminal lugs, and cable connections shall not be used for such purposes.

12.10 Draw-Out-Type Circuit Breakers

When draw-out-type circuit breakers are removed or inserted, the breaker shall be: In the Open position and the doors are closed where design permits.

12.11 Re-energizing Circuits After Protective Device Operation

a) After a circuit is de-energized by a circuit protective device, the circuit shall not be manually re-energized until it has been determined (by qualified persons) that the equipment can be safely energized and proper authorization obtained prior to re-energizing. Refer to Resetting Lockout Relays and Re-energizing Equipment .
b) Re-energization shall be performed by qualified personnel in accordance with CAP Standing Operating Procedures.

12.12 Safety Interlocks of Safety Switches, Combination Starters and Like Equipment

a) Only qualified electrical workers following the requirements for working within the Restricted Approach Boundary shall be permitted to defeat or bypass an electrical safety interlock over which the person has sole control, and then only temporarily while the qualified person is working on the equipment.
b) Switching Keyed Interlocks (Kirk Key type interlocks) that are interlocks used for operational purposes and are interlocked to prevent access into equipment or switch operation without certain conditions being met are not allowed to be defeated or bypassed in any fashion unless the effected circuits have been put into an Electrically Safe Work Condition. These types of interlocks are not to be used for personal protection or lockout/tagout purposes.

12.13 Excavation, Coring and Confined Space Permits (130.9, 10)

Coring permits are required prior to any drilling of walls or floors. Digging permits are required prior to excavation, penetration, or digging into the earth in excess of 6". The permitting process is administered by the Engineering Department. Entering a confined space with exposed, energized circuit parts or conductors requires a confined space permit, administered by the Safety department.

12.14 Safe Work Practices for Specific Equipment

12.14.1 Capacitors and Surge Arrestors

a) Before employees work on capacitors, the capacitors shall be disconnected from energized sources and, after a wait of at least 5 minutes from the time of disconnection, short-circuited.
b) Before the units are handled, each unit shall be short-circuited between all terminals and the capacitor case or its rack. If the cases of capacitors are on ungrounded substation racks, the racks shall be bonded to ground.
c) Any line to which capacitors are connected shall be short-circuited (grounded) before it is considered de-energized.

12.14.2 Current Transformers

a) The secondary circuit of a current transformer may not be opened while the transformer is energized. Opening the secondary circuit of an energized current transformer will result in extremely high voltages on the secondary circuit. This creates an electrocution hazard to employees and will cause major electrical wiring and equipment failures. If the primary of the current transformer cannot be de-energized before work is performed on an instrument, relay, or other section of a current transformer secondary circuit, the circuit shall be bridged so that the current transformer secondary will not be opened.
b) Most current transformer circuits have shorting bars or links located on terminal blocks at some point in the circuit to aid in the bridging of the secondary circuit. NOTE: Not all current transformer terminations have these shorting bars, therefore in such cases the current transformer must be de-energized. When lifting wires on any circuit extreme care must be taken to not inadvertently open the wrong circuit. Before lifting wires, wiring diagrams and schematics should be consulted to avoid this error.

c) Typically current transformer secondary circuits have a "Q" as one of the letters designating the circuit. (Examples 1TQ1A = Transformer 1 CT circuit phase A, 1MQB = Unit 1 motor CT circuit phase B, 1GQ0 = Unit 1 Generator CT circuit neutral).

12.14.3 Battery and DC Systems

a) Proper goggles and face shields will be worn while servicing batteries
b) Chemical-resistant gloves will be worn while servicing batteries.
c) Portable or stationary eyewash stations and shower shall be available.
d) All tools used while working on energized DC systems or while servicing batteries shall be of the insulated type to prevent any sparking.
e) No other conductive tools or materials shall be used where they may make circuit contact while servicing batteries (ie, tape measures, or other hand tools).

12.15 Performing Tests on Equipment in an Electrically Safe Work Condition

a) When performing field testing that involves high voltages, the area shall be barricaded to prevent unauthorized persons from entering.
b) Test equipment that operates at high voltages (hipot, insulation resistance, Doble testing, etc.) shall be used in accordance with manufacturer's instructions. Equipment under test must be grounded to place or remove leads.
c) The conductive part of the equipment being tested shall be kept grounded while the testing is not in process.
d) Following completion of DC hipot or insulation resistance tests, the test specimen must be grounded for four times the duration of the test to bleed off absorbed charge.

13 WORK WITHIN ENERGIZED SWITCHYARDS AND SUBSTATIONS (130.8)

13.1 Personnel Working Within Switchyard

When working within a switchyard or substation, employees must not go nearer to uninsulated energized power lines, nor take any conductive objects nearer than the limited approach boundary, with the exception that a qualified electrical worker may cross the limited approach boundary only when placing the lines in an electrically safe working condition.

Where the work to be performed is within the limited approach boundary, such as erecting scaffolding, the lines shall be put into an electrically safe work condition, including visible grounds near the work site. The safe work area shall be clearly marked and energized areas flagged off.

Scaffolding shall be bonded to the equipment being accessed to create an equipotential zone.

Unqualified persons or are allowed into switchyards and substations under the following rules and circumstances:

a) A qualified person has reviewed the work that the unqualified person is performing and assures that it will be outside of the Limited Approach Boundary of overhead lines. A job briefing is required for the unqualified employee. This may be done once with an individual for repetitive work such as routine inspections and the employee will then be allowed to perform it in the future without briefing.
b) For work that is not repetitive or is performed by individuals not familiar with the hazards or performed by contractors, the qualified person will escort the worker(s) while the work is being performed.

13.2 Mobile Equipment within Switchyards

Mobile equipment used for work within the switchyards and substations includes but is not limited to, aerial devices, passenger trucks, earthmoving equipment and cranes.

13.2.1 Bonding Mobile Equipment Used in Electrically Safe Work Zones

This paragraph applies to mobile equipment used to access conductors and apparatus that have been placed in an electrically safe work condition. The equipment is normally stationary while the work is being done. The purpose of bonding mobile equipment to the worksite grounding system (during de-energized work), is to control and minimize transferred touch potentials between the structure, equipment, and vehicle during an accidental energization of the line. Vehicle and equipment grounds are to be used in conjunction with properly installed personal protective grounds. In no instance shall vehicle and equipment grounds be used in place of personal protective grounds. Ground cables used for equipment and vehicle grounding shall be no smaller than #1/0 copper and shall be tested in accordance with CAP personal protective ground testing procedure Pumping Plant Tool Ground Electrical Annual Test Procedure. Ground cables on reels or looped on the vehicle shall be completely unwound to allow thorough inspection of the cable prior to use as well as eliminate destructive forces resulting from induction in the event of a fault at the worksite. Refer to USBR FIST 5-1 Personal Protective Grounding for Electric Power Facilities for more information.

13.2.2 Mobile Equipment Used in Transit Near Energized Lines

This paragraph applies to mobile equipment used in energized yards or near energized lines. The equipment will commonly be in motion much of the time while the work is being done and is not encroaching the limited approach boundary. In this application, the equipment will not be bonded to the ground system, therefore the following rules apply:

a) No part of the mobile equipment may cross the limited approach boundary as it is used on the job.
b) Any parts of the equipment that are capable of being moved into the limited approach boundary, such as a boom or bucket, must be restrained to prevent this from happening.
c) The equipment operator must remain in the cab while in the switchyard, and only enter or exit the vehicle outside the switchyard.
d) Personnel on the ground must avoid contact with the vehicle while in the switchyard.

14 TEST INSTRUMENTS AND EQUIPMENT (110.4)

14.1 Diagnostic Testing

Only qualified electrical workers shall perform tasks such as testing, troubleshooting, and voltage measuring on energized electrical conductors or circuit parts operating above 50 volts.

14.2 Test Instruments Requirements

All test instruments, and their accessories shall be rated for circuits and equipment to which they will be exposed. Personal tools and test instruments shall not be used on CAP equipment.

a) All hand held multi-meters and accessories (including test leads) for field use shall meet the IEC (International Electrotechnical Commission) CAT IV safety rating standard.
b) All hand-held scopemeters and accessories (including test leads) for field use shall meet the IEC (International Electrotechnical Commission) CAT III safety rating standard.
c) Test instruments for bench use, and for field use in the communications, electronics, and SCADA may be rated CAT I through IV depending upon the application.
d) All test instruments, equipment, leads, cable, power cords, probes, and connectors shall be visually inspected for external defects and damage before each use.
e) When test instruments are used for testing the absence of voltage on conductors or circuit parts operating above 50 volts, the operation of the test equipment shall be verified before and after an absence of voltage test is performed. This test must be performed on a known energized circuit or a live-dead-live tester.

14.3 Portable Cord- and Plug- Connected Electrical Equipment (110.5)

a) Portable equipment shall be handled in a manner that will not cause damage.
b) Power cords shall not be used for raising or lowering equipment.
c) Extension cords shall not be fastened with staples or hung in a fashion that may cause damage to the outer jacket or insulation.
d) Power cords and extension cords shall be inspected before each use and if damage is found to the outer jacket, insulation, or plug connectors it shall be removed from service for replacement or repairs.
e) Extension cords used with grounding-type utilization equipment shall contain an equipment grounding conductor.
f) Attachment plugs and receptacles on power cord equipment or extension cords shall not be connected or altered in a manner that would interrupt continuity of the grounding conductor. Additionally, these devices shall not be altered in order to allow use in a manner that was not intended by the manufacturer.
g) Adapters that interrupt the continuity of the equipment grounding conductor shall not be used.
h) All plug and receptacle equipment shall be used only with proper mating equipment.
i) All locking-type plug and connector equipment shall be secured (locked) after connection.

14.4 Wet or damp locations

a) Portable electrical equipment used in wet work locations or which is likely to contact or be drenched with water or conductive liquids shall be protected by a ground-fault-circuit-interrupter (GFCI).
b) GFCI protection devices shall be tested in accordance with manufacturer's instructions or before each use.
c) Employee's hands or plug and receptacle equipment shall not be wet when plugging and unplugging power or extension cords into a live receptacle.

14.5 Ground Fault Circuit Interrupter Protection (110.6)

a) GFCI protection shall be provided where required by applicable state, federal or local codes and standards. Listed cord sets or devices incorporating listed GFCI protection shall be permitted.
b) GFCI protection or an assured grounding program shall be employed for maintenance and construction activities using 120 volt, 15-, 20- or 30- ampere circuits.
c) GFCI receptacles shall be tested as part of the facility safety maintenance program and prior to use.

14.6 Overcurrent Protection Devices

The following requirements apply to overcurrent protection of circuits rated 600 volts, nominal, or less.

a) Conductors and equipment must be protected from overcurrent in accordance with their ability to safely conduct current and the conductors must have sufficient current-carrying capacity to carry the load.
b) Overcurrent devices must not interrupt the continuity of the grounded conductor unless all conductors of the circuit are opened simultaneously, except for motor-running overload protection.
c) Overcurrent devices must be readily accessible and not located where they could create an employee safety hazard by being exposed to physical damage or located in the vicinity of easily ignitable material.
d) Fuses and circuit breakers must be so located or shielded that employees will not be burned or otherwise injured by their operation, e.g., arcing.
e) Overcurrent protection of circuits and conductors shall not be modified, even on a temporary basis, beyond the ampacity of what is permitted by applicable portions of electrical codes and standards dealing with overcurrent protection.

14.7 Requirements for use of Portable/Vehicle Mounted Generators

14.7.1 General Requirements

a) The generator may only supply equipment located on the generator or the vehicle and cord- and plug-connected equipment through receptacles mounted on the generator or the vehicle.
b) The non-current-carrying metal parts of the equipment and the equipment grounding conductor terminals of the receptacles shall be bonded to the generator frame.
c) In the case of vehicle mounted generators, the frame of the generator shall be bonded to the vehicle frame.
d) Any neutral conductor shall be bonded to the generator frame.

14.7.2 Earthing Requirements for Portable and Vehicle-mounted Generators

Under the conditions listed above in General Requirements, the frame of a portable generator need not be connected to earth and the frame may serve as the ground (in place of the earth).

14.7.3 When a Ground Rod is Required

If the portable generator is providing temporary electric power to a structure (home, office, shop, trailer, or similar) the structure service entrance must be connected to a grounding electrode system, such as a driven ground rod.

If the generator neutral is directly connected to the system neutral, no ground rod is required. If the neutral is switched through a transfer switch, then a ground rod is required.

Grounding requirements for generators connected via transfer switches are covered by Article 250 of the National Electrical Code

15 PERSONAL AND OTHER PROTECTIVE EQUIPMENT (130.7)

15.1 General

PPE includes protective clothing and equipment to protect personnel from exposure to arc flash hazards and shock hazards identified by the risk analysis. When a qualified electrical worker is working within the restricted approach boundary, the worker shall wear shock protection equipment consisting of shock protective gloves, insulating tools and/or insulating blankets as necessary. When an employee is working within the arc flash boundary, he or she shall wear arc rated clothing and other personal protective equipment as listed in Appendix C, rated for the incident energy determined by the risk analysis. All parts of the body inside the arc flash boundary shall be protected. All qualified electrical workers shall wear Electrical Hazard rated footwear. All employees shall wear proper hardhats. All employees working on exposed energized electrical circuits at any voltage level shall wear proper eye protection.

15.2 Care of Personal Equipment

a) It is the responsibility of the employee to provide care for his PPE.
b) CAP provided protective equipment shall be visually inspected per manufacturer's recommendations before each use.
c) Protective equipment shall be stored in a manner to prevent damage from moisture, dust, physical damage, or other types of deterioration.

15.3 Body Protection

All qualified electrical workers shall wear CAP provided 8 cal/cm^2 arc-rated shirts and pants when in field areas or CAP facilities. Qualified electrical workers shall wear arc-rated PPE as specified in Appendix C anytime they are within an arc flash boundary.

15.3.1 Arc Flash PPE Categories

There are four categories of arc flash PPE defined by NFPA 70E Table 130.7(C)(15)(c), see Appendix C. Each category defines clothing and protective equipment to be worn for protection against increasingly higher

incident energies. CAP issues arc flash PPE kits equal to category 2 and category 4 to every qualified electrical worker whose job duties require it.

15.4 Eye Protection

Employees shall wear approved eye protection while working on all energized equipment. This rule also includes electrical equipment energized below 50 volts which includes battery systems. Additionally, eye protection is required whenever there is any danger of injury from electric arcs, flashes, or from flying objects resulting from electrical explosion.

15.5 Hearing Protection

Employees shall wear hearing protection whenever working within the arc flash boundary.

15.6 Hand Protection

15.6.1 Shock Protection

a) Qualified electrical workers shall wear insulating gloves with leather protectors for shock protection anytime the worker's hand(s) cross a restricted approach boundary.
b) Class 0 insulating gloves with leather protectors are the standard gloves issued to and used by CAP qualified electrical workers since the highest voltages where the restricted approach boundary may be crossed by the worker's hands will be 600V class gear (typically 600V class gear is energized at 480 volts nominal). Class 0 insulating gloves with leather protectors are rated for use at up to 1000 VAC.
c) Insulating gloves will be issued only to qualified electrical workers and shall be replaced or tested at intervals not exceeding 6 months.
d) Insulating gloves shall be stored and carried cuff down in a bag, box, or container that is designed for this purpose. Insulating gloves may be kept inside of the leather protectors.
e) Insulating gloves shall be visually inspected inside and out, and field air-tested before use each day and at shorter intervals if there is cause to suspect damage, and immediately following any incident that can reasonably be suspected of having caused damage. Any damage such as holes, tears, punctures, cuts, cracking, swelling, texture changes, hardening, becoming sticky or inelastic, contamination with chemicals, embedded foreign objects, shall render the glove unusable and the pair shall be returned to the warehouse for return and testing by the vendor.
f) Insulating gloves should be uniquely identified (i.e., serial number or other marking).
g) Insulating gloves shall be wiped clean of any oil, grease, or other damaging substances as soon as possible.
h) Heat, light, sunlight, oil, petroleum products, and distortion are natural enemies of rubber and insulating gloves should be guarded from these as much as possible.

15.6.2 Arc Flash Protection

Hand protection shall be worn where there is a possible exposure to arc flash burn. The apparel described in Appendix C shall be required for protection of hands from burns.

15.7 Foot Protection

All qualified electrical workers are required to wear ASTM F2413-05 approved footware with electrical hazard (EH) rating.

15.8 Factors in Selection of Protective Clothing

a) Layering – nonmelting, flammable fiber garments shall be permitted to be used as underlayers in conjuction with arc-rated garments in a layered system, e.g.: cotton underwear, cotton shirt and trouser and an arc-rated coverall.
b) Outer Layers – Garments worn as outer layers over arc-rated clothing shall also be made from arc-rated material. Non arc-rated outerwear may not be worn inside an arc flash boundary.
c) Underlayers – meltable fibers such as acetate, nylon, polyester, polypropylene and spandex shall not be permitted.

15.9 Care and Maintenance of Arc-Rated Clothing

a) Inspection – Arc-rated apparel shall be inspected before each use. Protective items that become contaminated with grease, oil, or flammable liquids or combustible materials shall not be used.
b) Manufacturer's instructions for the care and maintenance of arc-rated apparel shall be followed, including cleaning and repair.
c) Storage – arc-rated apparel shall be stored in a manner that prevents physical damage; damage from moisture, dust, or other deteriorating agents; or contamination from flammable or combustible materials.

15.10 Insulated Tools and Equipment (130.7(D))

Qualified electrical workers shall use insulated tools or handling equipment, or both, when working inside the restricted approach boundary. Insulated tools shall be protected from damage to the insulating material.

15.10.1 Requirements for insulated tools.

a) Insulated tools shall be rated for the voltages on which they are used.
b) Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.
c) Insulated tools and equipment shall be inspected prior to each use.

15.10.2 Live-line Tools

Fiberglass-reinforced plastic (FRP) live-line tools shall be designed and constructed to withstand the following minimum test:

100,000 volts per foot of length for 5 minutes.

a) Each live-line tool shall be wiped clean and visually inspected for defects before use each day.
b) If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is present after wiping, the tool shall be removed from service and examined and tested.
c) Live-line tools used at CAP shall be tested annually. Pumping Plant Tool Ground Electrical Annual Test Procedure

15.10.3 Ropes and Handlines

Ropes and handlines used within the limited approach boundary shall be nonconductive.

15.10.4 Portable Ladders

Portable ladders shall have nonconductive side rails when used within the limited approach boundary or where the employee or ladder could contact exposed energized electrical conductors or circuit parts.

15.10.5 Protective Shields

Protective shields, protective barriers, or insulating materials shall be used to protect each employee from shock, burns, or other electrically related injuries while an employee is working within the limited approach boundary.

15.11 Alerting Techniques around energized work 130.7(E), (F)

When working with exposed energized electrical circuits, panels, conductors, or when racking out or removing breakers from energized gear the qualified electrical worker shall barricade the area off to prevent personnel from inadvertently entering the arc flash or limited approach boundaries. If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees.

Where work performed on equipment in an electrically safe work condition is in an area with other energized equipment that is similar in size, shape and construction, signs or barricades shall be employed to prevent the employee from entering look-alike equipment.

15.12 Personal Protective Grounds (USBR FIST 5-1)

15.12.1 Purpose

The primary purpose of personal protective grounding is to provide adequate protection against electrical shock causing death or injury to personnel while working on de-energized lines or equipment. This is accomplished by grounding and bonding lines and equipment to limit the body contact or exposure voltages at the worksite to a safe value if the lines or equipment are accidentally energized from any source of hazardous energy. The greatest source of hazardous energy in most cases is direct energization of lines or equipment from the power system. Other sources of hazardous energy may include:

a) Stored energy (capacitors)
b) Electromagnetic coupling
c) Static charge build-up
d) High-voltage testing
e) Faulted equipment
f) Instrument transformer backfeed

15.12.2 Uses Permitted

a) Over 600 volts (required).
   Lines and equipment with a nominal voltage rating over 600 volts must have personal protective grounds applied as part of the process of creating an electrically safe work condition if the work requires crossing the restricted approach boundary. Other nearby exposed parts of any electrical equipment rated over 600 volts which are not associated with the work, but may be approached within the restricted

approach boundary during the work activities, shall either be de-energized and grounded or
suitably isolated to prevent contact.

b) Less than 600 volts (optional).
Grounding of equipment and circuits rated 600 volts or less is optional. Equipment and circuits operating below 600 volts can be just as deadly under the right conditions as higher voltage equipment. However, application of personal protective grounds on circuits below 600 volts may create unnecessary hazards due to limited approach distances and close proximity between conductors and grounded parts of equipment.

15.12.3 Uses not Permitted

a) Lightning.
For de-energized, grounded work on transmission lines, switchyards and
substations, personal protective grounds cannot be relied upon to provide
adequate safety from a direct or indirect lightning strike within the line of sight. Therefore, work shall not be performed while there is any indication of lightning in the area.

b) Over 50,000 Amperes Available Fault Current.
Extreme electromechanical separation forces are developed in ground cables for currents exceeding 50,000 amperes, symmetrical. Mechanical failure of the ground cable assembly is likely. The method of double-isolation grounding is recommended in lieu of conventional direct application of protective grounds. Refer to HECP manual.

c) Non-Temporary Installations.
Personal protective grounding is intended for temporary grounding during
installation, maintenance, and repair or modification of lines and equipment. It is not intended to substitute for a prolonged or permanent plant or station equipment grounding connection which should be provided by permanent grounding and wiring methods.

15.12.4 Requirements for Personal Protective Grounds

Protective ground cables and associated grounding equipment shall meet the following requirements:

a) Capable of conducting the maximum fault current which could occur at the grounded worksite if the de-energized line or equipment becomes energized from any source and for the fault clearing times below:
1) Thirty cycles (1/2 second) for transmission and distribution lines;
2) Fifteen cycles (1/4 second) for switchyards and substations; or
3) Fifteen cycles (1/4 second) for power and pumping plants.
CAP utilizes 4/0 AWG grounding cable sets for all applications to prevent an employee from utilizing an undersized grounding cable.
Exception: Grounding sets used in underground rural distribution equipment (load-break elbows).

b) Capable of withstanding a second energization within 30 cycles after a first inadvertent energization.
c) Each single point ground is tagged at both ends with a unique identifier and its length. Multi-point grounds have a unique identifier and length tag at the clamp end of each leg.
d) Single and multi-point grounds (ground clusters) are tested annually as an assembled unit. A grounding assembly that has been modified (e.g.; a clamp replaced) must be retested before use. A record of the tests is filed under the facility plant safety/protective equipment folder in Content Server. Pumping Plant Tool Ground Electrical Annual Test Procedure .

16 RELATIONSHIPS WITH CONTRACT EMPLOYERS (CONTRACTORS) (110.3)

16.1 CAP Responsibilities to Contract Employers

The department hiring the contractor is responsible for the following:

a) Shall inform the contractor of all known hazards that are related to the contractor's work.
b) Shall report to the contractor information about the installation necessary for the contractor to make proper safety assessments.
c) Shall report to the contractor all observed contract-employee violations of this program.

16.2 Contract Employer Responsibilities

a) The contractor shall ensure that each of their employees is instructed in the hazards communicated to the contractor by the responsible CAP department.
b) The contractor shall ensure that all of their employees have had the required training with respect to job function they will be performing.
c) The contract employer shall ensure that each of their employees follow the work practices required by their program and CAP Electrical Safety Program.
d) The contract employer shall keep CAP advised of:
    1) Any unique hazards presented by the contractor's work.
    2) Any hazards found during the contractor's work that were not communicated by CAP.
    3) The measures that the contractor takes to correct any violations reported to them by CAP and how similar violations are prevented from re-occurring.

16.3 Pre-Job Safety Meeting (Special Work Permit)

CAP will communicate job related hazards to the contractor prior to work beginning and issue a special work permit documenting this information.

17 ARC FLASH HAZARD ANALYSIS

17.1 Arc Flash Hazard Analysis Report

a) CAP Engineering Resources will perform an arc-flash incident energy analysis of all electrical equipment rated above 50 volts. The incident energy analysis determines the severity of potential arc flash hazards by identifying the arc flash boundary, the incident energy at the minimum working distance, and the required

PPE to be used within an arc flash boundary. This analysis provides the information and tools that can be used to reduce the potential incident energy exposure. The assumptions, calculations, methodology, findings, and recommendations made while performing the incident energy analysis of these circuits must be documented in the facility Arc Flash Hazard Analysis Report. The incident energy analysis must be performed in tandem with an equipment duty evaluation and a protective device coordination study.

b) Maintenance test data such as breaker and relay trip times should be used in the incident energy analysis as opposed to performance assumptions based on manufacturer specifications.
c) The engineer performing the analysis will make recommendations identified in the Report to reduce hazards, improve coordination or correct equipment deficiencies. The recommendations must be documented in the CMMS or the asset modification process.
d) The Arc Flash Hazard Analysis Report must be updated when a major modification or renovation takes place, including external system/utility changes.
e) The Arc Flash Hazard Analysis Report must be reviewed at least once every 5 years by Engineering Resources and updated to account for changes in the electrical systems that could affect the results of the analysis, updated arc flash hazard information or guidance, and revised industry standards.
f) The Arc Flash Hazard Analysis Report shall be maintained in Content Server under the facility reports and studies folder*.*

17.2 Electrical Hazard Warning Labels – Editing, Printing and Applying

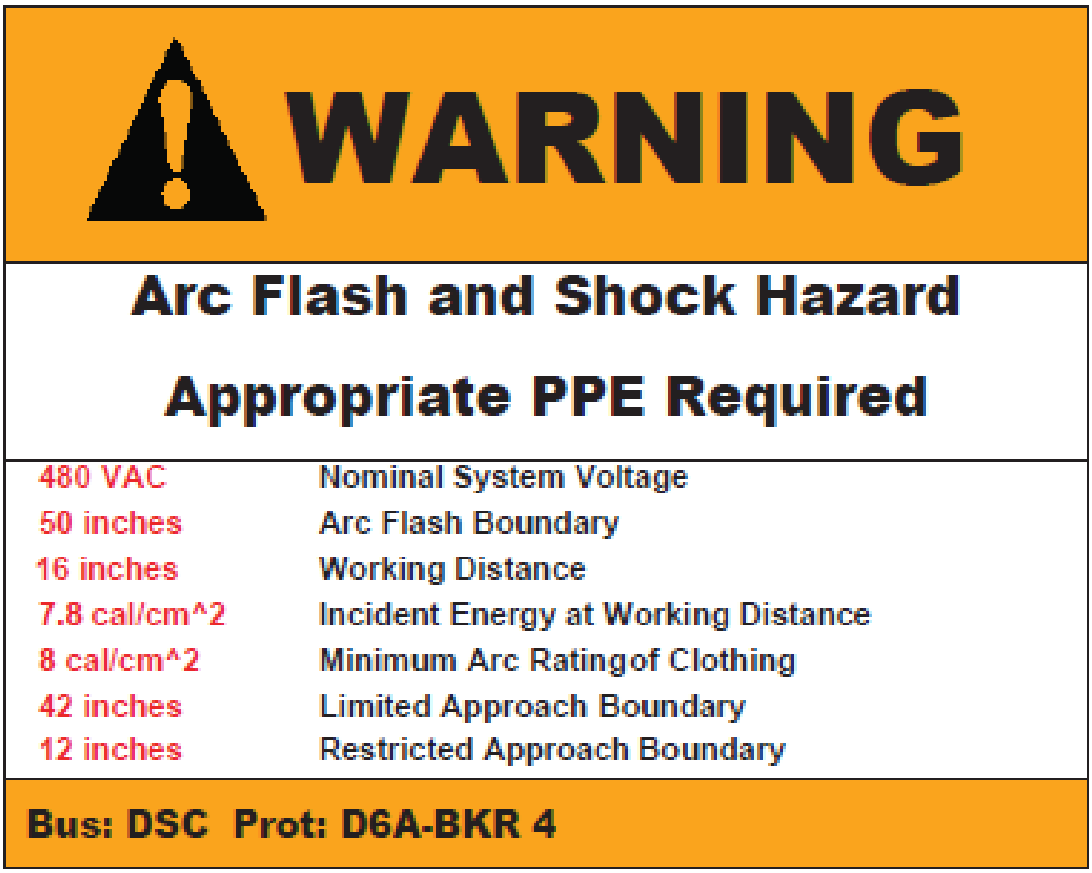
a) The Arc Flash Hazard Analysis Report shall produce a set of electrical hazard warning labels in pdf format. The warning label file will be sent to Electrical Safety Administration for review.
b) Electrical Safety Administration will review the label file, comparing to the facility equipment, and report any missing equipment, or label errors back to the engineer. Engineering will generate additional labels as needed to correct deficiencies.
c) Electrical Safety Administration will edit the file as required to make label copies (where there are multiple access panels on the same equipment); or change panel or protective device designations, where the incident energy analysis designations do not always match equipment designations.
d) Electrical Safety Administration will print labels from the final approved label file and apply them on the equipment at the facility.
e) The facility electrical hazard warning label file will be stored in Content Server in the Electrical Safety Program folder.

18 REFERENCES

- NFPA 70E Standard for Electrical Safety in the Workplace 2018
- NFPA 70 National Electrical Code
- USBR FIST Vol. 5-1 Personal Protective Grounding for Power Facilities and Power Lines
- USBR FIST Vol. 1-1 Hazardous Energy Control Program
- USBR FIST Vol. 5-14 Electrical Safety Program
- CAP Hazardous Energy Control Program (HECP)

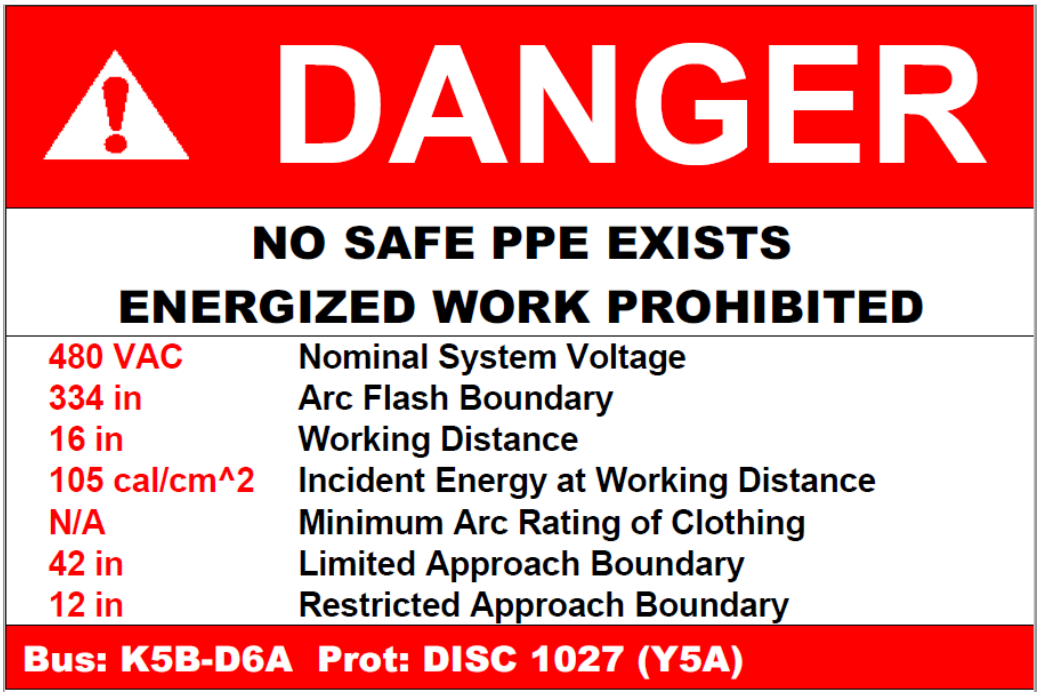
APPENDIX A: EQUIPMENT LABELING

All electrical equipment greater than 50 volts at CAP that has had an Arc Flash Hazard Analysis performed shall be labeled with standard electrical hazard labels.

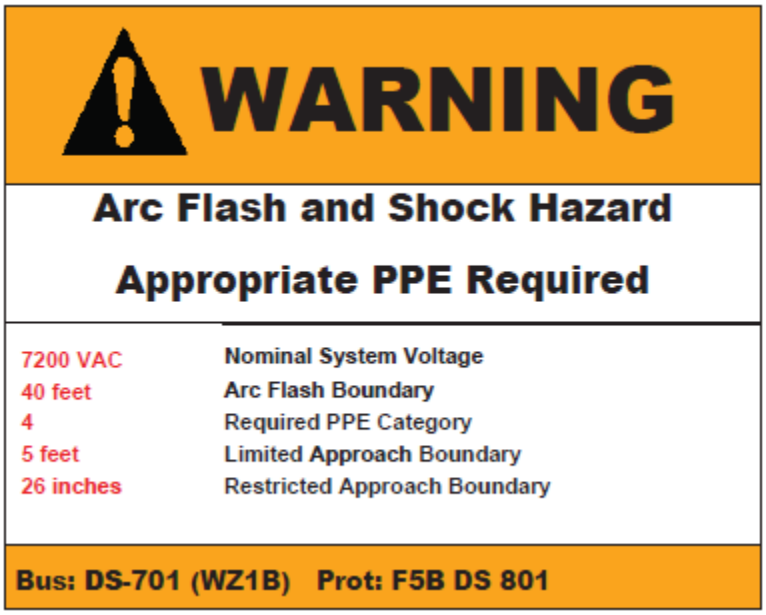


(1) Voltage level of the circuit
(2) Distance from exposed, energized parts at which arc flash PPE is required.
(3) Minimum distance a worker's face or chest is allowed to approach for energized work
(4) Energy a person at the working distance would be exposed to if an arc flash event occurred
(5) Minimum arc rating of clothing used in arc flash PPE to cross the arc flash boundary
(6) Minimum allowable approach distance for unqualified workers
(7) Distance at which insulating PPE must be worn or insulated tools employed
(8) Equipment designation and overcurrent interrupting device protecting that equipment

Example of a Danger Label (incident energy exceeds PPE arc rating). Tasks involving an arc flash hazard must not be performed when energized (including placing equipment in an electrically safe work condition). Upstream source must be de-energized before approaching exposed parts.



Example of an electrical hazard label on equipment that has not had an incident energy analysis performed. Arc flash boundary and PPE requirements determined from NFPA 70E Tables 130.7(C)(15)(a) and (b). See Appendix D



APPENDIX B: SHOCK PROTECTION BOUNDARIES

NFPA 70E Table 130.4(D)(a) Alternating Current Systems

(1)	(2)	(3)	(4)
	Limited Approach Boundary[b]		Restricted Approach Boundary[b]; Includes Inadvertent Movement Adder
Nominal System Voltage Range, Phase to Phase[a]	Exposed Movable Conductor[c]	Exposed Fixed Circuit Part	
Less than 50 V	Not specified	Not specified	Not specified
50 V–150 V[d]	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
151 V–750 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
751 V–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–36 kV	3.0 m (10 ft 0 in.)	1.8 m (6 ft 0 in.)	0.8 m (2 ft 7 in.)
36.1 kV–46 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
46.1 kV–72.5 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 3 in.)
72.6 kV–121 kV	3.3 m (10 ft 8 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 4 in.)
138 kV–145 kV	3.4 m (11 ft 0 in.)	3.0 m (10 ft 0 in.)	1.2 m (3 ft 10 in.)
161 kV–169 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.3 m (4 ft 3 in.)
230 kV–242 kV	4.0 m (13 ft 0 in.)	4.0 m (13 ft 0 in.)	1.7 m (5 ft 8 in.)

Notes:

(1) For arc flash boundary, see 130.5(A).
(2) All dimensions are distance from exposed energized electrical conductors or circuit parts to employee.

[a]For single-phase systems above 250 volts, select the range that is equal to the system's maximum phase-to-ground voltage multiplied by 1.732.

[b]See definition in Article 100 and text in 130.4(D)(2) and Informative Annex C for elaboration.

[c]*Exposed movable conductors* describes a condition in which the distance between the conductor and a person is not under the control of the person. The term is normally applied to overhead line conductors supported by poles.

[d]This includes circuits where the exposure does not exceed 120 volts nominal.

NFPA70E Table 130.4(D)(b) Direct Current Voltage Systems

(1)	(2)	(3)	(4)
	Limited Approach Boundary		Restricted Approach Boundary[b]; Includes Inadvertent Movement Adder
Nominal Potential Difference	Exposed Movable Conductor[c]	Exposed Fixed Circuit Part	
Less than 50 V	Not specified	Not specified	Not specified
50 V–300 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
301 V–1 kV	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
1.1 kV–5 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.5 m (1 ft 5 in.)
5 kV–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–45 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
45.1 kV– 75 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 2 in.)
75.1 kV–150 kV	3.3 m (10 ft 8 in.)	3.0 m (10 ft 0 in.)	1.2 m (3 ft 10 in.)
150.1 kV–250 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.6 m (5 ft 3 in.)
250.1 kV–500 kV	6.0 m (20 ft 0 in.)	6.0 m (20 ft 0 in.)	3.5 m (11 ft 6 in.)
500.1 kV–800 kV	8.0 m (26 ft 0 in.)	8.0 m (26 ft 0 in.)	5.0 m (16 ft 5 in.)

Note:

[a]All dimensions are distance from exposed energized electrical conductors or circuit parts to worker.

[b]*Exposed movable conductors* describes a condition in which the distance between the conductor and a person is not under the control of the person. The term is normally applied to overhead line conductors supported by poles

APPENDIX C: PERSONAL PROTECTIVE EQUIPMENT PPE

NFPA 70E Table 130.7(C)(15)(c)

Arc-Flash PPE Category	PPE
1	**Arc-Rated Clothing, Minimum Arc Rating of 4 cal/cm^2** *(Note 1)* Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated face shield *(Note 2)* or arc flash suit hood Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) *(Note 3)* Heavy duty leather gloves *(Note 4)* Leather footwear (AN)
2	**Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm^2** *(Note 1)* Arc-rated long-sleeve shirt and pants or arc-rated coverall Arc-rated flash suit hood or arc-rated face shield *(Note 2)* and arc-rated balaclava Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) *(Note 3)* Heavy duty leather gloves *(Note 4)* Leather footwear
3	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 25 cal/cm^2** *(Note 1)* Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR Arc-rated arc flash suit hood Arc-rated gloves *(Note 4)* Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) *(Note 3)* Leather footwear
4	**Arc-Rated Clothing Selected so That the System Arc Rating Meets the Required Minimum Arc Rating of 40 cal/cm^2** *(Note 1)* Arc-rated long-sleeve shirt (AR) Arc-rated pants (AR) Arc-rated coverall (AR) Arc-rated arc flash suit jacket (AR) Arc-rated arc flash suit pants (AR) Arc-rated arc flash suit hood Arc-rated gloves *(Note 4)* Arc-rated jacket, parka, rainwear, or hard hat liner (AN) **Protective Equipment** Hard hat Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) *(Note 3)* Leather footwear

AN: as needed (optional). AR: as required. SR: selection required.

Notes:

(1) *Arc rating* is defined in Article 100.

(2) Face shields are to have wrap-around guarding to protect not only the face, but also the forehead, ears, and neck, or, alternatively, an arc-rated arc flash suit hood is required to be worn.

(3) Other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood.

(4) If rubber insulating gloves with leather protectors are used, additional leather or arc-rated gloves are not required. The combination of rubber insulating gloves with leather protectors satisfies the arc flash protection requirement.

APPENDIX D: ARC FLASH PPE CATEGORIES FOR AC AND DC SYSTEMS

NFPA 70E Table 130.7(C)(15)(a) Alternating Current (ac) Systems

Equipment	Arc-Flash PPE Category	Arc-Flash Boundary
Panelboards or other equipment rated 240 V and below Parameters: Maximum of 25 kA available fault current; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance	1	19 in
Panelboards or other equipment rated greater than 240 V and up to 600 V Parameters: Maximum of 25 kA available fault current; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance	2	3 ft
600 v class motor control centers (MCCs) Parameters: Maximum of 65 kA available fault current; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance	2	5 ft
600 v class motor control centers (MCCs) Parameters: Maximum of 42 kA available fault current; maximum of 0.33 sec (20 cycle) fault clearing time; minimum 18 in. working distance	4	14 ft
600 V class switchgear (with power circuit breakers or fused switches) and 600 V class switchboards Parameters: Maximum of 35 kA available fault current; maximum of 0.5 sec (30 cycle) fault clearing time; minimum 18 in. working distance	4	20 ft
Other 600 V class (277 V through 600 V, nominal) equipment Parameters: Maximum of 65 kA available fault current; maximum of 0.03 sec (2 cycle) fault clearing time; minimum 18 in. working distance	4	20 ft
NEMA E2 (fused contactor) motor starters, 2.3 kV through 7.2kV Parameters: Maximum of 35 kA available fault current; maximum of 0.24 sec (15 cycle) fault clearing time; minimum 36 in. working distance	4	40 ft
Metal clad switchgear, 1 kV through 15kV Parameters: Maximum of 35 kA available fault current; maximum of 0.24 sec (15 cycle) fault clearing time; minimum 36 in. working distance	4	40 ft
Arc-resistant switchgear 1 kV through 15kV (for clearing times of less than 0.5 sec (30 cycle) with an available fault current not to exceed the arc-resistant rating of the equipment), and metal-enclosed interrupter switchgear, fused or unfused of arc-resistant-type construction, 1 kV through 15 kV	N/A (doors closed)	N/A (doors closed)

Parameters: Maximum of 35 kA available fault current; maximum of 0.24 sec (15 cycle) fault clearing time; minimum 36 in. working distance	4 (doors open)	40 ft
Other Equipment 1kV through 15 kV Parameters: Maximum of 35 kA available fault current; maximum of 0.24 sec (15 cycle) fault clearing time; minimum 36 in. working distance	4	40 ft

Note: For equipment rated 600 volts and below and protected by upstream current-limiting fuses or current-limiting circuit breakers sized at 200 amperes or less, the arc flash PPE category can be reduced by one number but not below arc flash PPE category 1.

Informational Note to Table 130.7(C)(15)(a): The following are typical fault clearing times of overcurrent protective devices:

1) 0.5 cycle fault clearing time is typical for current limiting fuses when the fault current is within the current limiting range.
2) 1.5 cycle fault clearing time is typical for molded case circuit breakers rated less than 1000 volts with an instantaneous integral trip.
3) 3.0 cycle fault clearing time is typical for insulated case circuit breakers rated less than 1000 volts with an instantaneous integral trip or relay operated trip.
4) 5.0 cycle fault clearing time is typical forrelay operated circuit breakers rated 1 kV to 35 kV when the relay operates in the instantaneous range (i.e., “no intentional delay”).
5) 20 cycle fault clearing time is typical for low-voltage power and insulated case circuit breakers with a short time fault clearing delay for motor inrush.
6) 30 cycle fault clearing time is typical for low-voltage power and insulated case circuit breakers with a short time fault clearing delay without instantaneous trip.

NFPA 70E Table 130.7(C)(15)(b) Direct Current (ac) Systems

Equipment	Arc-Flash PPE Category	Arc-Flash Boundary
Storage batteries, dc switchboards and other dc supply sources Parameters: Greater than or equal to 100 V and less than or equal to 250 V Maximum arc duration and minimum working distance: 2 sec @ 18 in.		
Available fault current less than 4 kA	2	3 ft
Available fault current greater than or equal to 4 kA and less than 7 kA	2	4 ft
Available fault current greater than or equal to 7 kA and less than 15 kA	3	6 ft
Storage batteries, dc switchboards and other dc supply sources Parameters: Greater than or equal to 250 V and less than or equal to 600 V Maximum arc duration and minimum working distance: 2 sec @ 18 in.		
Available fault current less than 1.5 kA	2	3 ft
Available fault current greater than or equal to 1.5 kA and less than 3 kA	2	4 ft
Available fault current greater than or equal to 3 kA and less than 7 kA	3	6 ft
Available fault current greater than or equal to 7 kA and less than 10 kA	4	8 ft

Notes:

1) Apparel that can be expected to be exposed to electrolyte must meet both of the following conditions:
   a. Be evaluated for electrolyte protection
   b. Be arc-rated

2) A two-second arc duration is assumed if there is no overcurrent protective device (OCPD) or if the fault clearing time is not known. If the fault clearing time is known and is less than 2 seconds, an incident energy analysis could provide a more representative result

APPENDIX E: ESTIMATE OF THE LIKELIHOOD OF OCCURRENCE OF AN ARC-FLASH INCIDENT FOR AC AND DC SYSTEMS

NFPA 70E Table 130.5(C)

Task	Equipment Condition	Likelihood of Occurrence*
Reading a panel meter while operating a meter switch Performing infrared thermography and other non-contact inspections outside the restricted approach boundary. This activity does not include opening of doors or covers. Working on control circuits with exposed energized electrical conductors and circuit parts nominal 125 volts ac or dc, or below, without any other exposed energized equipment over nominal 125 volts ac or dc, including opening of hinged covers to gain access. Examination of insulated cable with no manipulation of cable. For dc systems, insertion or removal of individual cells or multi-cell units of a battery system in an open rack. For dc systems, maintenance on a single cell of a battery system or multi-cell units in an open rack.	Any	No
For ac systems, work on energized electrical conductors and circuit parts, including voltage testing. For dc systems, working on energized electrical conductors and circuit parts of series-connected battery cells, including voltage testing. Removal or installation of CB's or switches Opening hinged door(s) or cover(s) or removal of bolted covers (to expose bare, energized electrical conductors and circuit parts). Fpor dc systems, this includes bolted covers, such as battery terminal covers Application of temporary protective grounding equipment, after voltage test. Working on control circuits with exposed energized electrical conductors and circuit parts, greater than 120 volts. Insertion or removal of individual starter buckets from motor control center (MCC). Insertion or removal (racking) of circuit breakers (CB's) or starters from cubicles, doors open or closed. Insertion or removal of plug-in devices into or from busways. Examination of insulated cable with manipulation of cable. Working on exposed energized electrical conductors and circuit parts of equipment directly supplied by a panelboard or motor control center. Insertion or removal of revenue meters (kW-hour, at primary voltage and current). Removal of battery conductive intercell connector covers. For dc systems, working on exposed energized electrical conductors and circuit parts of utilization equipment directly supplied by a dc source. Opening voltage transformer or control power transformer compartments.	Any	Yes

Operation of outdoor disconnect switch (hookstick operated) at 1 kV through 15 kV. Operation of outdoor disconnect switch (gang-operated, from grade) at 1 kV through 15 kV.	Any	Yes
Operation of a CB, switch, contactor or starter operation with enclosure doors closed. Voltage testing on individual battery cells or individual multi-cell units. Removal or installation of covers for equipment such as wireways, junction boxes, and cable trays that does not expose bare, energized electrical conductors and circuit parts. Opening a panelboard hinged door or cover to access dead front overcurrent devices. Removal of battery nonconductive intercell connector covers.	Normal	No
Maintenance and testing on individual battery cells or individual multi-cell units in an open rack. Insertion or removal of individual cells or multi-cell units of a battery system in an open rack. Arc-resistant switchgear type 1 or 2 (for clearing times of less than 0.5 sec with a prospective fault current not to exceed the arc-resistant rating of the equipment) and metal enclosed interrupter switchgear, fused or unfused of arc-resistant type construction, 1 kV through 15 kV. Insertion or removal (racking) of CB's from cubicles; Insertion or removal (racking) of ground and test device; or Insertion or removal (racking) of voltage transformers on or off the bus.	Abnormal	Yes

Equipment condition considered to be "normal" if all the following circumstances apply:

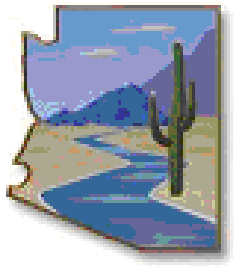
1) The equipment is properly installed in accordance with the manufacturer's recommendations and applicable industry codes and standards.
2) The equipment is properly maintained in accordance with the manufacturer's recommendations and applicable industry codes and standards.
3) The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer's instructions.
4) Equipment doors are closed and secured.
5) Equipment covers are in place and secured.
6) There is no evidence of impending failure such as arcing, overheating, loose or bound equipment parts, visible damage or deterioration.

*As defined in this standard, the two components of risk are the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a hazard. Risk assessment is an overall process that involves estimating both the likelihood of occurrence and severity to determine if additional protective measures are required. The estimate of the likelihood of occurrence contained in this table does not cover every possible condition or situation, nor does it address severity of injury or damage to health. Where this table identifies "No" as an estimate of likelihood of occurrence, it means that an arc flash incident is not likely to occur. Where this table identifies "Yes" as an estimate of likelihood of occurrence, it means that additional protective measures are required to be selected and implemented according to the hierarchy of risk control identified in 110.1(H).

APPENDIX F: LIFTED WIRE TAG

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

SAFETY AND HEALTH DEPARTMENT



WRITTEN FALL PROTECTION PROGRAM

JULY 5, 2011

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

FALL PROTECTION PROGRAM

Table of Contents

1.0 PURPOSE

The purpose of this program is to prevent or minimize worker injuries due to falls. This is to be accomplished as far as possible by engineering and administrative controls (i.e. eliminating the hazard where possible). When exposure to elevated fall hazards cannot be prevented through engineering and administrative controls, the appropriate personal fall protection system and equipment will be used to control the fall hazard.

2.0 SCOPE

This program covers all employees, vendors and contractors who are exposed to fall hazards. The program covers roles and responsibilities, fall protection requirements for ladders, fall protection work plans, self-assessment, training, and record-keeping requirements. This program applies to maintenance and operation activities, permanent installations and construction work. Key definitions are listed in Appendix A.

3.0 ROLES AND RESPONSIBILITIES

3.1 Safety & Health Manager

The Safety & Health Manager is the Fall Protection Program Administrator. The Safety & Health Department is responsible to ensure that the Fall Protection Program is in place and that individuals receive the necessary training. The Safety & Health Manager will also ensure that the Fall Protection Program is assessed bi-annually and that current codes or code changes regarding regulatory and company issues affecting fall protection are communicated to affected employees.

3.2 Qualified Person

The Engineering, Maintenance, and Safety & Health Departments will supply as many trained fall protection Qualified Persons as is necessary to provide coverage project wide. This person must have a recognized degree, professional certificate, or through extensive experience be fully qualified to:

- Assist in the review and design of fall protection systems.
- Analyze work tasks that require access to elevated work areas and develop control measures for fall protection work plans.
- Establish processes for integrating fall protection into new or modified building structures or equipment installations.
- Ensure that people under their direction are properly trained and informed.
- Provide resources needed to directly support a fall protection program.
- Approve elements of fall protection systems developed for specific tasks.

3.3 Management

3.3.1 All management whether supervisors or managers are responsible for assuring that only properly trained personnel are assigned tasks that require protection form falls.

3.3.2 Supervisors may train their employees on the use of specific fall protection equipment only after the employee has received training explaining CAWCD's Fall Protection program and the general hazards and consequences of falls (see section VII). Supervisors can also contact the Safety & Health Department to provide training for their employees.

3.3.3 All training including training provided by or overseen by supervisors on site must be documented in the CAP learning management system. Records of that training must be provided to the Safety and Health Department in writing as soon as is practical so the training can be documented. Information provided will include:

- The name of the employees trained
- The name of the employee providing the training
- The specific equipment trained on
- The date, time, and location of the training

3.4 Fall Protection Personnel

3.4.1 Competent Persons

- Are trained in the recognition of fall hazards, proper use of fall protection, and are familiar with the contents and administration of this document.
- Ensure that the employees preparing to use fall protection have been trained in:
  - Recognition of fall hazards.
  - Proper selection and use of fall protection (demonstrated).
  - The requirements of this program before being assigned to work at heights.
- Ensure that required fall protection equipment is available.
- Review each job for fall hazard potential and assess potential hazards and fall protection measures required.

- Ensure that employees are working safely and are in compliance with safe work practices. If a job cannot be done safely with available fall protection equipment and systems, the job will be halted until a safe plan/system is developed and installed.
- Ensure that fall protection equipment is inspected before each use, kept in good repair, and properly stored as per the manufacturer's instructions.
- Report any fear of heights or health conditions that may impair their ability to work safely at heights to their supervisor.
- Be trained to recognize fall hazards and successfully demonstrate the proper use of fall protection equipment before working at heights.
- Read, understand, and comply with the requirements of this program.
- Not perform any work that involves a fall hazard without the proper fall protection procedures, training, and equipment.
- Initiate CAWCD's Incident Investigation Process in the event of a fall or near miss so that measures can be taken to eliminate the fall hazard. Fall protection equipment involved in a fall will be immediately taken out of service and given to the assigned Incident Investigation team for inspection. **DO NOT REUSE**.

3.4.2 CAWCD Designated Representative for specific Contractors/Vendors
The CAWCD designated representative who brought the contractor or vendor on-site is responsible for ensuring only qualified contractors and vendors perform job tasks associated with fall hazards. The CAWCD designated representative will:

- Ensure that contractors and vendors have a Fall Protection Policy prepared prior to actual work activities beginning.
- Periodically monitor contractor and vendor work practices and ensure correct safe work practices are maintained.

3.4.3 Contractor and Vendors

- Will ensure their workers have the knowledge and competency to work safely, recognize fall hazards, and properly wear fall protection equipment prior to performing job duties on CAWCD property.
- Notify the CAWCD designated representative as soon as possible in the event of a fall or near miss so that measures can be taken to eliminate the fall hazard or safety concerns.
- Are responsible for supplying their own fall protection equipment and to ensure that it is inspected before each use, kept in good repair, and properly stored as recommended by the manufacturer's instructions.

4.0 FALL PROTECTION REQUIREMENTS

1. Where possible, fall hazards should be eliminated or engineered out. When exposure to fall hazards cannot be eliminated, the appropriate personal fall protection system and equipment will be used to control the fall hazard.
2. Each department will survey their workplace for recurring jobs that require the use of fall protection. (Examples: work on top of a transformer, a discharge tube, or at the edge of or over the canal). For each of these jobs a fall protection analysis will be generated defining the fall protection procedures to be used when performing that task. This analysis will include the specific equipment and procedures to be used to perform the task in a safe manner and can be embedded within the tasks PMO or JSA as long as each step and or requirement is outlined in the PMO or JSA. Any changes in the fall protection procedures will be documented through the PMO or JSA developed for that task.
3. Fall protection is required when workers are exposed to a fall hazard of 6 feet or more when performing construction activities, 4 feet or more when performing maintenance activities, or at any height when working over hazards increasing the likelihood of causing undue harm to the worker should a fall occur (Examples: projections, sharp or rough obstructions, moving equipment, etc.).
4. Fall protection is required when entering or exiting any lift extended greater than 4 feet and there is a gap greater than 12 inches between the lift and other surface.
5. Each permanently installed fall protection system (i.e. engineered anchor points) must have a documented fall protection plan and/or working instructions (i.e. SOP, PMO, JSA, etc.) that has been reviewed with workers who will use the system.
6. All employees who work at heights must be trained on the proper use of the specific equipment used to protect them from falls prior to using that equipment.
7. Only CAWCD provided and approved fall protection equipment will be used by employees. No employee owned equipment will be used unless prior approval is given by the Safety & Health Manager.
8. At no time and for no reason will an approved fall protection anchor point be used for ANY other purpose than fall protection. NO EXCEPTIONS. Any fall protection anchor point used for another purpose is no longer available for use in fall protection until evaluated by a qualified person.
9. When working directly over water the use of a tie off system can actually present an even greater hazard than falling into the water while wearing a personal floatation device. The decision to forgo the use of, or design and use fall protection systems for work over water will require evaluation by a Qualified Person on a case by case basis.
10. Fall protection is required when working on any "walking/working surface" that is 4 feet above an adjacent level. This would include unguarded catwalks, tops of transformers, tops of tanks, or any other working surface meeting the 4 foot criteria.

11. Job specific fall protection requirements and/or associated JSA's will be reviewed with workers prior to beginning work.

5.0 FALL PROTECTION FOR FIXED AND PORTABLE LADDERS

5.1 Usually no fall protection is required if the ladder is placed at the proper angle (one foot back for every 4 feet of rise), or when the ladder is used for access between different floor levels. However, fall protection on ladders may be required at any height depending on the specific hazards of the job. Some, but not all of these conditions are listed below.

1. Fall protection may be helpful when working on a ladder for an extended period of time (such as over 15 minutes) non-stop.
2. Fall protection is required if you are working from a ladder above significant hazards (see IV C.).
3. Fall protection is required when working on a ladder greater than 25 feet above the ground.
4. Fall protection is required when using a fixed ladder at or above 24 feet.
5. When using a ladder as a work platform it is advisable to use fall protection if the employee does not have at least one hand available to hold on to the ladder.

5.2 Fall protection systems when used with ladders, especially portable ladders will require evaluation by a qualified person.

6.0 SELF-ASSESSMENTS

The Safety & Health Manager will ensure that the CAWCD fall protection program is assessed bi-annually. Contractor fall protection programs and plans will be audited through the contractor audit process.

7.0 TRAINING

7.1 Fall Protection

All employees using fall protection equipment will be trained in the proper use of the fall protection equipment and methods. This training will include the following elements:

1. Program overview.
2. Assignment of duties and responsibilities outlined in the fall protection program.
3. Hazard recognition at heights and throughout the job site.
4. Use and operation of fall protection methods or types:

- Guardrail Systems.
- Personal Fall Arrest Systems.
- Personal Fall Restraint Systems.
- Warning Line Systems (to include limitation of mechanical equipment).
- Controlled Access Systems.
- Positioning Systems.

5. Determining the clearance for fall arrest systems.
6. Correct procedures for:
   - Inspecting equipment and systems (to include documentation).
   - Assembling and disassembling systems.
   - Maintaining (cleaning, storing, repairs).
7. Identifying warning systems and pass through protection that may be required for jobs including correct procedures for handling and storage of equipment and materials at heights, and for installing overhead protection.
8. Emergency rescue plans.

7.2 Refresher training for qualified persons, competent persons, and end users will be given at least every 2 years or more frequently as required by changes in work process, changes in equipment, and/or audit or incident investigation recommendations.

8.0 RECORD-KEEPING

8.0 Employee fall protection training is entered into CAWCD's Learning Management System.

8.1 Incidents involving near misses or falls will be investigated using the CAP Incident Investigation process. Records of any investigations will be kept as required by that program.

9.0 INSPECTIONS

9.0 Prior to each use the end user shall thoroughly inspect their own fall protection equipment, including the tie-off adaptor and anchorage point.

9.1 During routine Safety and Health inspections/audits, members of Safety and Health Staff will perform random inspections of personal fall arrest systems and anchorage points and document those inspections in their reports. In the event of abnormal findings enhanced inspection processes will be developed.

10.0 EMERGENCY RESCUE PLAN

Identify the detailed location of the work site with any information that will help to find the location; general location, floor, column, door, pump #, etc.

Identify the location of a lift that may be required for rescue and the key location.

Identify the location of the closest first aid kit. In the event an emergency rescue is required, call the Control Center at 8-2530.

While thinking through a rescue plan, you should review the fall hazards; the appropriate fall arrest or restraint system you have chosen for the particular job, then think through the ability to rescue an individual if they should fall.

Items to give consideration to are:

- Can the individual perform self-rescue? What's provided?
- If an employee does fall, will they hit anything on the way down? Is there a possibility of a swinging motion?
- Are there electrical or chemical hazards nearby?
- Access to hanging employee such as: obstructions blocking clear access to the employee, access for brining in other equipment to get a person down, etc.
- Can the person be safely raised or lowered? If lowered, what's below?
- Can the person be retrieved within 15 minutes?
- Who will perform the rescue?

FALL PROTECTION PROGRAM

APPENDIX A
Definitions

Anchorage	A secure point of attachment for lifelines, lanyards or deceleration devices which is capable of withstanding the forces specified in the applicable sections of the OSHA Standards.
Body Belt	A type 1 safety belt used in conjunction with lanyard or lifeline. **Body belts are not permitted for use in fall arrest applications**.
Competent Person	A person trained in the recognition of fall hazards, proper use of fall protection, and familiar with the contents and administration of this document. Any CAP employee using fall protection equipment must be trained to a competent person level.
Connector	A device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems to the anchorage system. Examples: carabiner, buckle, D-ring, and snap hook.
Continuous Fall Protection	The design and use of a fall protection system such that no exposure to an elevated fall hazard occurs at any time. This may require more than one fall protection system, lanyard, or a combination of prevention or protection measures.
Deceleration Device	Any mechanism, such as a rope grab, rip-stitch lanyard, specifically woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the maximum arresting energy imposed on an employee during a fall arrest.
Drop Line (Vertical Lifeline)	A vertical lifeline secured to an upper anchorage for the purpose of attaching a lanyard or device.
Fall Arrest System	The use of multiple, approved safety equipment components such as; body harnesses, lanyards, deceleration devices, drop lines, horizontal and/or vertical lifelines and anchors that are interconnected and rigged to arrest a free fall.

Fall Restraint System	An approved device and any necessary components that function together to restrain an employee in such manner as to prevent that employee from falling to a lower level. When standard guardrails are selected, compliance with applicable sections governing their construction and use must be followed.
Fall Distance	The actual distance from the worker's support to the level where a fall would stop.
Free Fall	The act of falling before a personal fall arrest system begins to apply force to arrest the fall.
Horizontal (Catenary) Lifeline	A rail, rope, wire, or synthetic cable that is installed in a horizontal plane between two anchorage's and used for attachment of a workers lanyard or lifeline device while moving horizontally.
Lanyard	A flexible line of webbing, rope, or cable, used to secure a harness (or body belt) to a lifeline or an anchorage point. Usually 2, 4, or 6 feet long.
Locking Snap Hook	A connecting snap hook that requires two separate forces to open the gate; one to deactivate the gatekeeper and a second to depress and open the gate which automatically closes when released; used to minimize roll out or accidental disengagement.
Positioning Belt	A single or multiple straps, having a D-ring on each side that can be secured around the workers body to hold the user in a work position; for example, a lineman's belt, a re-bar belt, or saddle belt.
Qualified Person	A person with a recognized degree or professional certificate and specific knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.
Restraint Line	A line from a fixed anchorage or between two anchorages to which an employee is secured in such a way as to prevent the worker from falling to a lower level.
Rope Grab	A fall arrester that is designed to move up or down a lifeline suspended from a fixed overhead or horizontal anchorage point, or lifeline, to which the harness is attached. In the event

	of a fall, the rope grab locks onto the lifeline rope through compression to arrest the fall. The use of a rope grab device is restricted for all restraint applications unless designed specifically by the manufacturer for that application.
Safety Monitor	A competent person who, having no additional duties, monitors the proximity of workers to the fall hazard when working between the warning line and the unprotected sides and edges including, the leading edge of a low-pitched roof or walking/working surface. **At CAWCD, the use of a safety monitor does not eliminate the need for a fall restraint or fall arrest system, whichever is appropriate when working outside of a designated warning line.**
Self Retracting Lifeline	A deceleration device that contains a drum wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which after onset of a fall automatically locks the drum and arrests a fall.
Shock Absorbing Lanyard	A flexible line of webbing, cable, or rope that has an integral shock absorber used to secure a harness to a lifeline or anchorage point.
Unprotected Sides and Edges	Any side or edge (except at entrances to points of access) of a floor, roof, ramp or runway where there is no wall or guardrail system.
Walking/Working Surface	Any area through which workers pass or conduct work.
Warning Line System	A barrier erected on a walking surface or a low pitch roof (4/12 pitch or less) to warn employees that they are approaching a/an unprotected fall hazard(s). This line will not be crossed without the use of fall protection

FALL PROTECTION PROGRAM

APPENDIX B
Guidelines for Fall Arrest System Tie-Off Anchor Points

Items normally ACCEPTABLE for Tie-Off

- Engineered anchor Points
- Minimum 6 inch x 6 inch wide flange beam, maximum span of 5 feet, with light load (e.g. catwalk support, small bore pipe support)
- Minimum 8 inch x 8 inch wide flange beam, maximum span of 10 feet, with light loads (e.g. platform support, cable tray support)
- Minimum 6 inch square tube steel beam, maximum span 7 feet, with light load (see below)
- Minimum 12 inch x 6 inch timber beam, maximum 6 foot spans, with light load
- Beams specifically designed for this purpose

Items UNACCEPTABLE for Tie-Off
(Unless approved by a Qualified Person)

- Handrail/Guardrail
- Toe plate
- Grating
- Process pipe less than 8 inches in diameter
- Any pipe with greater than 10 feet between vertical and lateral supports
- Any pipe with insulation
- Any pipe with thermal warnings
- Any hazardous piping
- Cable tray
- Conduit
- HVAC Duct
- Equipment support or restraint for piping, electrical, or ductwork
- Channel type Strut (i.e. unistrut)
- Bar joists
- Wall studs, metal or wood
- Fence or fence posts
- Metal deck (roof or floor)
- Door/window frames
- Door/window hardware
- Ladder (ladder rung approved if potential fall restricted to 2 feet or less and ladder secured top and bottom)
- Ladder cage

FALL PROTECTION PROGRAM

APPENDIX C
Fall Protection Equipment Inspection

All fall protection equipment must be inspected before each use.

All inspections must be done as per the manufacturer's instructions. Listed below are some general guidelines.

1. All fall protection equipment should be reasonably clean.
2. Inspect harness hardware (buckles, D-rings, back pad, loop keepers). These items must not be damaged, broken, distorted, and must be free of sharp edges, burrs, cracks, worn parts, or corrosion. PVC coated hardware must be free of cuts, rips, tears, holes, etc. n the coating to insure non-conductivity. Ensure buckles work freely. Inspect parachute buckle spring.
3. Inspect harness webbing. Material must be free of frayed, cut, or broken fibers. Check for tears, abrasions, mold, burns, or discoloration. Inspect stitching. Check for pulled or cut stitches. Broken stitches may be an indication that the harness has been impact loaded and must be removed from service.
4. Look for chemical damage which is evidenced by discoloration or fiber stiffness.
5. Inspect carabineers and clips for distortion, elongation, cracks, corrosion, and malfunctioning gates.
6. Inspect lanyards for cuts, frayed areas, broken strands, kinks, unusual wear patterns, and signs that it has arrested a fall such as broken stitches or a stretched shock absorbing section.
7. Inspect labels. All labels should be present and fully legible.
8. Inspect each system component or subsystem according to the manufacturer's instructions.
9. Record the inspection date and results in the attached Inspection and Maintenance Log.

Note: Any fall protection equipment that has actually arrested a fall must be immediately taken out of service and forwarded to the Safety & Health Department.

CENTRAL ARIZONA PROJECT

FIRE SAFETY PROGRAM

REVISED OCTOBER 1, 2019

FIRE SAFETY PROGRAM

1.0 PURPOSE

The purpose of the Fire Safety Program (FSP) is to protect Central Arizona Project (CAP) employees, facilities and visitors from fire hazards. This program provides employees with the basic knowledge of the principles, practices, rules and regulations to identify and control fire hazards.

The Fire Safety Program covers fire hazard identification, fire prevention, proper handling and storage of hazardous materials and evacuation procedures.

2.0 SCOPE

This program applies to all CAP employees, all facilities and all contractor employees.

3.0 RESPONSIBILITIES

3.1 **Management**: CAP management is responsible to see that a fire prevention program is established and enforced, and that fire-suppression systems are inspected and tested on a routine basis. Management (together with the Environmental Health and Safety (EH&S) Department) will also ensure the training of appropriate employees on the use of fire extinguishers, evacuation procedures and fire hazards in the workplace.

3.2 **Facility Supervisors:** Supervisors are responsible for proper storage and handling of flammable and combustible materials in the facilities under their supervision. Supervisors (together with the EH&S Department) shall ensure that employees receive Fire Safety Program training and, where applicable, fire extinguisher use training. Supervisors shall ensure employees follow all fire safety rules and understand how to properly store flammable and combustible materials.

3.3 **Employees**: CAP employees must comply with all fire safety rules, procedures and practices, including the safe storing and handling of flammable and combustible materials, as stated in this program. Every employee is responsible for general housekeeping in his or her work area.

Employees should know where fire alarm boxes are in their work area, be familiar with evacuation routes and the procedures to follow in the event of a fire. Employees should report all potential fire hazards to their supervisor immediately.

4.0 EMERGENCY NOTIFICATION PROCEDURES

4.1 **General Notification Procedures**: In all emergency situations, including fire, terrorism, and medical emergencies, regardless of location, contact the Control Center immediately at “2530” (623-869-2530). Where necessary, evacuate to a safe

location prior to making this notification. It is the Control Center's responsibility to notify the proper emergency response service(s). For specific details and procedures, refer to the CAP Emergency Operations Plan.

4.2 **Pumping Plants**: If the Control Center has not been able to establish communication with pumping plant personnel within two minutes of receiving an alarm signal, the Control Center will contact the appropriate emergency services and have them standing by. If five more minutes elapse without communication being established with plant personnel, the Control Center will request emergency services' response.

If the Control Center receives notification of smoke or fire at a pumping plant during unmanned hours, they will notify the plant supervisor who will call out qualified individuals to assess the situation. If the plant supervisor cannot be reached, the plant personnel will be notified.

5.0 WARNING AND EVACUATION SYSTEMS

5.1 **Headquarters:** In the event of a fire or emergency evacuation at headquarters' facilities, the fire alarm system will sound. All employees, with the exception of protective services personnel, assigned fire wardens, and Headquarters Maintenance staff, will immediately evacuate their work area upon hearing the fire alarm. For specific details and procedures, refer to the CAP Emergency Operations Plan.

5.2 **Pumping Plants and Field Facilities**: In the event of a fire or emergency in a pumping plant the code call "99" will sound. All employees will immediately evacuate the plant upon hearing the code call or the fire alarm system activated. Evacuation plans are specific to each pumping plant or field facility. Employees should follow the evacuation procedure for the facility that they are in at the time the fire or emergency notification is activated. For specific details and procedures, refer to the CAP Emergency Operations Plan or consult with the specific facility supervisor.

The following are general emergency procedures for all pumping plants.

1) If you are the first to report a fire or emergency situation dial the plant code, then 7, then 99 or use the manual fire alarm pull station.

2) Once the emergency code call or alarm has been sounded, it is MANDATORY that all personnel exit the plant using the closest available stairway, even if the code call or alarm is in error, a practical joke, or a drill. DO NOT USE THE ELEVATOR.

3) All personnel and visitors known to have been present in the pumping plant or shown on the sign-in sheet must be accounted for. Plant personnel are responsible for overseeing the emergency evacuation of visiting crews and tour groups.

4) An EMERGENCY SITUATION is defined as an event of a serious nature, developing unexpectedly, that WILL ENDANGER: 1) LIFE, or2) the structural integrity of the aqueduct, pumping plants and/or property downstream, and which demands immediate attention. If a situation is LIFE THREATENING, evacuate to a safe location, locate a safe communications device and contact the Control Center at 2530 (623-869-2530).

5.3 **Persons with Disabilities**: Fire wardens are responsible to provide assistance to employees that require aid to evacuate a building or work area in a fire or emergency condition.

5.4 **Resuming Normal Operations**: After an emergency has been fully addressed and neutralized at a pumping plant, complete the following general procedure:

a) Conduct an employee briefing: Code call: 5-5.
b) Identify a meeting place.
c) Establish priorities for resuming operations.
d) Continue to ensure the safety of personnel on the property.
e) Assess remaining hazards.
f) Maintain security at the incident scene.

6.0 MEANS OF EGRESS

6.1 **Basic Requirements**: Every CAP building that is designed for human occupancy must have sufficient exits to allow for a rapid escape by employees in case of a fire or other emergency.

6.2 **Design Requirements**: Any and all modifications designed and implemented on CAP buildings for human occupancy shall not impact the escape routes that employees may need to take. The areas where more than one employee works must have multiple escape routes.

6.3 **Exit Requirements**: To afford all occupants convenient facilities for escape, all buildings or structures will be provided with exits of kinds, numbers, location and capacity appropriate to the individual building or structure, with due regard to the character of the occupancy, the number of persons exposed, the fire protection available, and the height and type of construction of the building or structure.

All exits will be so arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied. It is understood that no lock or fastening device designed to prevent free escape from the inside of any building will be installed.

6.4 **Egress Marking**: Every exit will be clearly visible or the route to reach it will be conspicuously indicated in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point, and each path of escape in its entirety will be so arranged or marked that the way to a place of safety outside is unmistakable.

Any doorway or passageway not constituting an exit or way to reach an exit, but of such a character as to be subject to being mistaken for an exit, will be so arranged or marked as to minimize its possible confusion with an exit and the resultant danger of persons endeavoring to escape from fire finding themselves trapped in a dead-end space, such as a cellar or storeroom, from which there is no other way out.

6.5 **Illumination Requirements**: In every building or structure equipped for artificial illumination, adequate and reliable illumination will be provided for all exit locations. Exit signs will be installed at the point of exit from the building.

Every building, structure, section or area thereof of such size, occupancy and arrangement that the reasonable safety of the occupants may be endangered by the blocking of any single means of egress due to fire or smoke will have at least two means of egress remote from each other, so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency conditions.

6.6 **Remodeled or New Building Construction**: No building or structure under construction will be occupied in whole or in part until all exit facilities required for the part occupied are completed and ready for use.

No existing building will be occupied during repairs or alterations unless all existing exits and any existing fire protection are continuously maintained or other measures are taken which provide equivalent safety.

No flammable or explosive substances will be introduced in a building while the building is occupied, unless the condition of use and safeguards provided are such as not to create any additional danger or handicap to egress beyond the normally permissible conditions in the building.

6.7 **Discharge from Exits**: All exits will discharge directly to the street, or to a yard, court or other open space that gives safe access to a public way. The street to which exits discharge will be of width adequate to accommodate all persons leaving

the building. Yards, courts or other open spaces to which exits discharge will also be of adequate width and size to provide all persons leaving the building with ready access to the street.

6.7 **Stairs:** Stairs and other exits will be so arranged as to make clear the direction of egress to the street. Exit stairs that continue beyond the floor of discharge will be interrupted at the floor of discharge by partitions, doors or other effective means.

6.8 **Maintenance**: All required exits, ways of approach thereto and ways of travel from the exit into the street or open space will be continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

6.9 **Furnishings and Decorations**: No furnishings, decorations or other objects will be placed as to obstruct exits, access thereto, egress there from or visibility thereof. No furnishings or decorations of an explosive or highly flammable character will be used in any occupancy.

7.0 FIRE FACTS

7.1 **Fire Classifications**: All fires require an ignition source in order to start or be sustained. Fires are classified in four classes by their elements:

- Class “A” - consist of wood, paper, rubber, plastics and cloth materials.
- Class “B” – consists of flammable gases, liquids and greases such as gasoline, oil, oil-based paints and lacquers.
- Class “C” – consists of electrical fires or materials near electrically powered equipment such as fuse boxes, circuit breakers and appliances.
- Class “D” – consists of combustible metals such as magnesium, zirconium, potassium and sodium.

7.2 **Fire Extinguishers**: When operated properly, portable fire extinguishers are effective to fight small incipient fires. To be effectively controlled and extinguished, each class of fire requires a specific type of fire extinguisher. The following table is a general guideline regarding fire extinguisher types and uses.

TYPE	USE	EXTINGUISHING MEDIA
Class A	For ordinary combustible materials such as paper, wood, cardboard and most plastics.	The numerical rating on these types of extinguishers indicates the amount of water it holds and the amount of fire it can extinguish.
Class B	Fires involve flammable or combustible liquids such as gasoline, kerosene, grease and oil.	The numerical rating for class B extinguishers indicates the

		approximate number of square feet of fire it can extinguish.
Class C	Fires involve electrical equipment, such as appliances, wiring, circuit breakers and outlets.	The C classification means the extinguishing agent is non-conductive.
Class D	Fires that involve combustible metals, such as magnesium, titanium, potassium and sodium.	These types of extinguishers also have no numerical rating, nor are they given a multi-purpose rating - they are designed for class D fires only.
Dry chemical	Extinguishers come in a variety of types and are suitable for a combination of **Class A, B and C fires**.	These are filled with foam or powder and pressurized with nitrogen.
BC	This is the regular type of dry chemical extinguisher. It is filled with sodium bicarbonate or potassium bicarbonate.	The BC variety leaves a mildly corrosive residue, which must be cleaned immediately to prevent any damage to materials.
ABC	This is the multipurpose dry chemical extinguisher.	The ABC type is filled with mono-ammonium phosphate, a yellow powder that leaves a sticky residue that may be damaging to electrical appliances such as a computer.
Carbon Dioxide (CO2)	For **Class B and C fires**.	**CO2** extinguishers contain carbon dioxide, a non-flammable gas, and are highly pressurized.

Fire extinguishers shall be installed according to local, state and federal requirements and placed in conspicuous places easily accessible by employees.

All fire extinguishers at CAP will be inspected routinely and properly maintained in good operating condition. The following table lists the inspection and maintenance schedule

Type of Inspection or Maintenance	Responsibility
Monthly visual inspections	Assigned maintenance staff
Annual maintenance check	HVAC/Fire Protection
Six (6) year tear down maintenance	HVAC/Fire Protection
Twelve (12) year hydrostatic test	HVAC/Fire Protection

7.3 Fire Systems Operations: Every automatic sprinkler system, fire detection and alarm system, exit lighting, fire door and other item of equipment, where provided, will be maintained in proper operating condition. Periodic inspections and tests will be made as are necessary to ensure proper maintenance. Inspections will be conducted on a quarterly basis.

8.0 FIRE PRECAUTIONS

8.1 Ignition Sources: Fire hazard control is essential to the elimination of fires. To help avoid fires from starting the following precautions shall be observed:

- Keep sources of open flames such as welding and cutting torches, matches and other heat sources away from flammable materials.
- Never cut or weld on a container unless it has been properly purged.
- Use only non-sparking tools in areas where flammable materials such as batteries are inspected or maintained.
- Avoid static discharges in areas where flammable materials are contained or handled.
- Use Safety Data Sheets (SDS) to ensure that incompatible materials such as oxidizers are stored in separate areas or cabinets.

8.2 Housekeeping: Good housekeeping techniques are important for the prevention of fires and keeping evacuation routes clear in case of a fire emergency.

- Floors shall be properly maintained; wet floors shall be identified by conspicuous means such as a warning sign or barriers.
- Aisles and major thoroughfares shall be kept clear of combustibles and not used for storage of materials.
- Combustible materials shall be kept away from heat sources such as portable heaters under desks.
- All solvent wastes and flammable liquids shall be kept in fire-resistant, covered containers.
- Smoking shall be in designated areas only. Cigarette butts must be discarded in approved containers.
- Trash cans in office areas should be emptied on a daily basis.
- Containers for oily rags shall have the covers on except when rags are being added or the container is being emptied.
- Fuel-gas cylinders and oxygen cylinders shall be separated by distance, fire-resistant barriers or other means while in storage.

9.0 FIRE CONTROL TECHNIQUES

9.1 Fire Identification and Notification: If a fire starts, the first person to notice it shall activate the nearest fire alarm no matter the size of the fire. Always follow the procedures in the CAP Emergency Operations Plan.

9.2 Pumping Plants and Aqueduct Facilities:

1. Dial 8-2530 in the pumping plants. The Control Center will coordinate the emergency response.

2. Familiarize yourself with the evacuation route at your Pumping Plant and work areas before an emergency occurs. The building or work area may be dark and smoky in an actual fire. An evacuation plan should be posted. Locate the manual fire alarm stations in your area.

3. If you are working in a pumping plant, when you hear the Emergency Code Call "99", evacuate the plant immediately and in an orderly manner, using the closest stairway, traveling upwards. Do not use the elevator. Assemble at the plant's emergency assembly area.

4. Upon evacuation, all pumping plant personnel are trained to pick-up the sign-in sheet as they exit the plant. From the sign-in sheet, personnel will account for everyone working in the plant.

5. Personnel familiar with the building's electrical and mechanical systems should be available to advise the fire department.

9.3 Headquarters Facilities:

1. Dial -0- in Building 1 and 2. The Control Center will coordinate the emergency response.

2. Familiarize yourself with the evacuation route in all CAP facilities and work areas before an emergency occurs. The building or work area may be dark and smoky in an actual fire. An evacuation plan should be posted. Locate the manual fire alarm stations in your area.

3. When you hear the fire alarm, evacuate the facility immediately and in an orderly manner, using the closest stairway. Do not use the elevator.

4. The assembly point for Building 1 and 2 is the Helicopter Building parking lot. Make sure you report your presence to your supervisor when you arrive at the assembly point.

5. Assigned Floor Wardens will assist in directing all employees out of Building 1 and 2. After an office is checked, the Floor Wardens will close the door and turn out the lights, if necessary. When an office is found with the door closed and locked the Floor Warden will knock on the door and attempt to advise anyone in the office that a fire alarm has been sounded. The Floor Warden will then

clear the remainder of his/her area of responsibility and advise Safety and/or Protective Services of the location of the locked door.

6. Personnel familiar with the building's electrical and mechanical systems should be available to advise the fire department.

9.4 **General Precautions**: The following are general precautions to be followed in the event of a fire:

a) All employees should evacuate the building immediately closing all windows and doors.
b) Do not lock office doors.
c) Never use an elevator to escape a burning building.
d) Do not enter a smoky or superheated atmosphere. Smoke contains toxic gases.
e) Do not get into a situation that would block you from exiting the plant.
f) Firefighting activities shall be limited to fires that may be fought without anyone being subjected to smoke, electrocution, burns or other injury, and then only by trained personnel (see sections 9.5, 10.0 and 11.0 below).
g) Particular attention should be paid to the possibility of coming into contact with electrical current when investigating equipment overheating, suspicious odors, etc.
h) Plant personnel will assist the fire department with plant entry, electrical lockout, technical information, communications (use of telephone), etc., but only if safe to do so.

9.5 **Fire Extinguisher Use**: An employee that has received training in the use of a fire extinguisher may use an extinguisher to fight small or incipient fires. A small or incipient fire typically is about the size of a trash can. If an employee is in doubt of being able to successfully fight the fire, he/she should immediately leave the area of the fire and activate the fire alarm. Never place yourself between a fire and your escape route. ***Never fight a fire unless you have been trained how to use a fire extinguisher.***

9.6 **Trapped in an Office**: If an employee finds himself or herself trapped and unable to safely exit an office or room near a fire, follow this procedure:

- Call for help immediately.
- Close all windows and doors in the room or office.
- If smoke is entering the room under a door, attempt to stuff a non -combustible material under the door.
- Stay close to the floor and position yourself near a window or near an exterior wall if one is available.

10.0 FIRE EXTINGUISHERS

10.1 Fire Extinguisher Discharge: The following action(s) shall be taken if a fire extinguisher of the type listed below is discharged.

10.1.1 CF-33 Discharge in Paint Room

a) Account for all personnel
b) Personnel shall refrain from entering the Paint Room
c) See System Reset section in SOP H-5 to clear smoke and vapors.

10.1.2 Halon Discharge in Control Room

a) Account for all personnel
b) Personnel shall not enter the Control Room until authorization is given by the EH&S Department.
c) See System Reset section in SOP H-5 to exhaust the control room
d) When vapors and smoke have cleared, determine if the Halon discharge was caused by valid protection or accidental operation
e) Notify the Control Center of the status of the duplex control board and related Control Room equipment.

10.2 How to Operate a Fire Extinguisher: Where necessary, CAP trains employees to operate fire extinguishers using the PASS method:

Pull the pin on the fire extinguisher handle
Aim the nozzle or horn at the base of the fire
Squeeze the trigger on the handle
Sweep side to side along the base of the fire

11.0 TRAINING

All CAP employees shall receive initial training on this FSP. Refresher training will be provided dependent upon job responsibilities. Retraining may be required for individuals or groups of employees if:

- Changes are made to this program, procedures or state and federal regulations.
- New fire hazards are introduced in the workplace.
- There are deviations in knowledge or understanding of fire safety.

Annual training in the use of fire extinguishers is provided for select employees in maintenance groups (including those assigned to perform hot work), Protective Services, EH&S, and other departments. In the event of a fire, all employees are instructed to evacuate. However, an employee that has been properly trained may choose to use an extinguisher to fight an incipient (beginning) stage fire if it is safe to do so.

Records for all training conducted under this program shall be maintained in the CAP Learning Center.

12.0 FIRE DRILLS

Fire drills will be conducted on a routine basis at various CAP locations for the sole purpose of familiarization with CAP evacuation procedures. Drills will be coordinated and documented.

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1.0 GENERAL REQUIREMENTS

This program contains safety requirements relating to fire protection, design, maintenance and use of powered industrial trucks, including tractors, platform lifts trucks, motorized hand trucks, powered by electric motors or internal combustion engines used by Central Arizona Water Conservation District (CAWCD) employees.

1.1. COMPLIANCE STANDARDS

This document was prepared in accordance with 29 CFR 1910.178, the Federal Occupational Safety and Health Administration (OSHA) Powered Industrial Trucks Standard, American National Standards Institutes (ANSI) B56.1-1969 and the U.S. Department of the Interior-Bureau of Reclamation (BOR) Safety and Health Standard.

1.2. PROGRAM COMPLIANCE

Compliance with instructions and procedures contained in the Forklift Program is mandatory. Willful disregard for this program or any of its provisions may result in corrective action as outlined in CAWCD Administrative Policy Directive-12 Corrective Action.

2.0 APPROVED TRUCKS

Approved trucks shall bear a label or other identifying mark indicating approval by the testing laboratory. No modifications and additions, which affect capacity and safe operation, can be made without prior written approval of the manufacturer.

2.1. NAMEPLATES AND DECALS

Operations and maintenance instruction plates and decals or tags shall be changed to reflect any approved modifications. All nameplates and markings shall be in place and maintained in a legible condition.

3.0 DESIGN

Eleven different designations of industrial trucks are identified in the OSHA standard, listed as follows:

1. D designated units are diesel powered, having similar fire hazard safeguards as gasoline powered units.

2. DS designated units are diesel powered similar to D units with additional safeguards for exhaust, fuel and electrical systems. They may be used in locations where D units are considered unsuitable.

3. DY designated units are diesel powered similar to DS units that do not have any electrical equipment including the ignition and are equipped with temperature limiting features.

4. E designated units are electrically powered, having minimal safeguards against inherent fire hazards.

5. ES designated units are electrically powered that have additional safeguards to the electrical systems to prevent emission of hazardous sparks and temperature limiting features. They may be used in locations where E units are considered unsuitable.

6. EE designated units are electrically powered that have similar requirements of E and ES units. The electric motors and all other electrical equipment are completely enclosed. The EE unit may be used in locations where E and ES units are considered unsuitable.

7. EX designated units are electrically powered that have electrical fittings and equipment designed, constructed and assembled so that the units may be used in certain atmospheres containing flammable vapors or dusts.

8. G designated units are gasoline powered, having minimal safeguards against inherent fire hazards.

9. GS designated units are gasoline powered with additional safeguards for exhaust, fuel and electrical systems. They may be used in locations where G units are considered unsuitable.

10. LP designated units are liquefied petroleum gas powered units, having similar fire hazard safeguards as gasoline powered units.

11. LPS designated units are liquefied petroleum gas powered with additional safeguards for exhaust, fuel and electrical systems. They may be used in locations where LP units are considered unsuitable.

4.0 SAFETY GUARDS

If the type of load presents a hazard, the user must equip the fork truck with a vertical load backrest extension. High Lift Rider trucks must be fitted with an overhead guard, unless operating conditions do not permit. All forklifts must have an approved fire extinguisher on board.

5.0 FUEL HANDLING AND STORAGE

The storage and handling of liquid fuels such as gasoline and diesel fuel must be in accordance with "NFPA Flammable and Combustible Liquids Code" (NFPA No. 30-1969); that of liquefied petroleum gas fuel must be in accordance with "NFPA

Storage and Handling of Liquefied Petroleum Gases" (NFPA No. 58-1969) and applicable local fire codes. The following safety practices shall apply while refueling forklifts at CAWCD:

5.1. LIQUEFIED PETROLEUM GAS VEHICLES (LPG)

- No Smoking while refueling LPG.
- Exhaust fuel from fuel lines by closing tank value and running the engine of the forklift.
- Use proper lifting techniques when handling LPG cylinders.
- Ensure LPG tanks are properly secured to the lift truck.
- O-rings should be checked when fuel tanks are changed.

5.2. GASOLINE AND DIESEL VEHICLES

- No Smoking while refueling.
- Do not operate forklift truck while refueling.
- Portable containers must be identified and approved for use.
- Clean up any spills immediately.

5.3. CHANGING AND CHARGING STORAGE BATTERIES

Battery charging installations

- Must be located in areas designated for that purpose. Reinstalled batteries must be properly positioned and secured in the truck.
- The designated battery charging area must have an approved fire extinguisher available at all times.

Battery Charging

- An eye wash station must be located within charging area and as close as possible to the battery storage location. Employees must use appropriate PPE.
- When charging batteries, pour acid into water; do not pour water into acid.
- Lockout/Tagout procedures shall be followed when working on batteries and equipment.
- Provide facilities for flushing and neutralizing spilled electrolyte.
- Protect charging apparatus from damage by trucks.
- Provide ventilation for dispersal of fumes from gassing batteries.
- A conveyor, overhead hoist, or equivalent material handling equipment must be provided for handling batteries.
- A carbon filter or siphon must be provided for handling electrolyte.

Battery Maintenance

1. Lockout/Tagout procedures shall be followed when performing maintenance activities on forklift batteries.
2. Trucks must be properly positioned and brakes applied before attempting to change or charge batteries.
3. Care must be taken to assure that vent caps are functioning. The battery (or compartment) cover(s) must be open to dissipate heat.

Battery Fire Hazards

Smoking is prohibited within the charging area. Precautions must be taken to prevent open flames, sparks or electric arcs in battery charging areas. Keep tools and other metallic objects away from the top of uncovered batteries.

6.0 LIGHTING FOR OPERATING AREAS

Where general lighting is less than two lumens per square foot, auxiliary directional lighting must be provided on the truck. To prevent injury to pedestrians and forklift operators, lighting should be as bright as possible. Loading and unloading of tractor-trailers may require additional temporary portable lighting.

7.0 CONTROL OF NOXIOUS GASES AND FUMES

Concentration levels of carbon monoxide gas created by powered industrial truck operations must not exceed acceptable levels. See the document "Air Contaminants: OSHA Standard 1910.1000." Contact CAWCD Safety department manager for additional information.

8.0 OPERATOR TRAINING

Only trained and authorized operators may be permitted to operate a powered industrial truck. Methods shall be devised to train operators in the safe operation of powered industrial trucks. Training shall consist of classroom instruction and forklift truck operations.

Training Requirements

Initial and retraining is required every three years.
A refresher course must be provided if:

- Unsafe operations, accidents or near misses occur.
- Failure to meet the training standard justifies retraining.

- Changes in the workplace environment and new or different vehicles require retraining.

Training Certification

CAWCD trainers shall certify that each operator has been trained and evaluated as required by the standard. The certification shall include the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.

9.0 TRUCK OPERATIONS

9.1. RIDING

- Trucks shall not be driven up to anyone standing in front of a bench or other fixed object.
- No person shall be allowed to stand or pass under the elevated portion of any truck, whether loaded or empty.
- Unauthorized personnel must not be permitted to ride on powered industrial trucks; a safe place to ride must be provided where riding of trucks is authorized.
- The employer must prohibit arms or legs from being placed between the uprights of the mast or outside the running lines of the truck.
- No standing is permitted while operating a forklift. **The operator shall be seated with the seat belt securely fastened.**

9.2. UNATTENDED FORKLIFTS

When a powered industrial truck is left unattended:

- Load engaging means must be fully lowered,
- Controls neutralized,
- Power shut off and brakes set.
- Wheels must be blocked if the truck is parked on an incline.

NOTE: A powered industrial truck is considered unattended when:

1. **The operator is 25 feet or more away from the vehicle,**
2. **Or whenever the operator leaves the vehicle and it is not in the operator's view.**

9.3. BRAKES AND CHOCKS

The brakes of highway trucks must be set and wheel chocks placed under the rear wheels to prevent the movement of trucks or trailers while loading or unloading.

Fixed jacks may be necessary to support a semi-trailer during loading or unloading when the trailer is not coupled to a tractor.

The flooring of trucks and trailers must be checked for breaks and weakness before they are driven onto.

9.4. OVERHEAD OBJECTS

There must be sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.

Use an overhead guard as protection against falling objects. It should be noted that an overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.

A load backrest extension must be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.

9.5. PERSONNEL LIFTING

Forklift trucks shall not be used for lifting personnel. Only equipment specifically designed for raising and lowering personnel shall be used.

9.6. FORKLIFT MAINTENANCE

Lockout/Tagout

Lockout/Tagout procedures shall be followed when performing maintenance and servicing activities on forklift.

Defective Forklifts

If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, it must be taken out of service until restored to safe operating condition.

No truck shall be operated with a leak in the fuel system until the leak has been corrected.

Refueling

1. Fuel tanks shall not be filled while the engine is running.
2. Spillage must be avoided.
3. Spillage of oil or fuel must be contained and cleaned up immediately and the fuel tank cap replaced before restarting the engine.
4. When changing tanks on LP forklifts the tank valve shall be closed and the vehicle and all fuel must be run out before disconnecting the connection hose.

Open flames shall not be used for checking electrolyte level in storage batteries or the gasoline level in fuel tanks. Don't use a match or cigarette lighter!

9.7. TRAVELING

- All traffic regulations must be observed, including authorized CAWCD facility speed limits.
- A safe distance must be maintained (approximately three truck lengths from the truck ahead), and the truck must be kept under control at all times.
- Other trucks traveling in the same direction at intersections, blind spots or other dangerous locations shall not be passed.
- The right of way must be yielded to ambulances, fire trucks or other vehicles in emergency situations.
- The driver shall be required to look in the direction of, and keep a clear view of the path of travel.
- Stunt driving and horseplay shall not be permitted, and running over loose objects on the roadway surface must be avoided.
- The driver is required to slow down and sound the horn at cross aisles and other locations where vision is obstructed.
- If the load being carried obstructs forward view, the driver is required to travel with the load trailing.

Grades

- Grades must be ascended or descended slowly.
- When ascending or descending grades in excess of ten percent, loaded trucks must be driven with the load upgrade.
- On all grades the load and load engaging means must be tilted back, if applicable, and raised only as far as necessary to clear the road surface.

Speed

- Under all travel conditions the truck must be operated at a speed that will permit it to be brought to a stop in a safe manner.
- The driver shall be required to slow down for wet and slippery floors.
- While negotiating turns, speed must be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion.
- Except when maneuvering at a very low speed, the hand steering wheel must be turned at a moderate, even rate.

Ramps

- A safe distance must be maintained from the edge of ramps or platforms while on any elevated dock, or platform.
- Trucks must not be used for opening or closing doors.
- Dockboards or bridgeplates must be properly secured before being driven over; they must be driven over carefully and slowly, and their rated capacity never exceeded.

9.8. LOADING

- Trucks shall handle only stable or safely arranged loads within their rated capacity.
- **Always check load capacity charts to verify forklift's ability to safely lift and carry the load.**
- Caution must be exercised when handling off-center loads that cannot be centered. Long or high (including multiple-tiered) loads that may affect capacity must be adjusted.

9.9. ENGAGING LOADS

1. A load engaging means (forks) shall be placed under the load as far as possible; the mast must be carefully tilted backward to stabilize the load.
2. Extreme care must be used when tilting the load forward or backward, particularly when high tiering.
3. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load.
4. An elevated load must not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiering, only enough tilt may be used to stabilize the load.
5. Trucks equipped with attachments must be operated as partially loaded trucks when not handling a load.

10.0 MAINTENANCE OF INDUSTRIAL TRUCKS

10.1. REMOVAL FROM SERVICE

Any power-operated industrial truck not in safe operating condition shall be removed from service, and authorized personnel must make all repairs. All replacement parts must be equivalent as to safety with those used in the original design.

10.2. REPAIRS TO FUEL AND IGNITION SYSTEMS

Repairs to the fuel and ignition systems of industrial trucks that involve fire hazards must be conducted only in locations designated for such repairs. Trucks in need of repairs to the electrical system must have the battery disconnected before repair.

10.3. ALTERATIONS

Industrial trucks may not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer. Nor may they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts, except for approved conversion of a truck from use of gasoline to liquefied petroleum gas as fuel as stated in section 10.4.

Additional counterweighing of fork trucks shall not be done unless approved by the truck manufacturer.

10.4. FUEL CONVERSIONS

Industrial trucks originally approved for the use of gasoline for fuel may be converted to liquefied petroleum gas fuel provided the complete conversion results in a truck that embodies the features specified for LP or LPS designated trucks. The manufacturer shall approve all such conversions to forklift equipment.

10.5. SAFETY CHECKS

Industrial trucks must be examined at least daily and before being placed in service, and must not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Each day a forklift safety checklist shall be completed before a forklift is placed in service. Where industrial trucks are used on a round-the-clock basis, they must be examined after each shift. **Defects when found shall be immediately reported and corrected before the truck is place back in service.**

10.6. MUFFLERS

Vehicles with mufflers having screens or other parts that may become clogged must not be operated while they are clogged. Any vehicle that emits hazardous sparks or flames

from the exhaust system must immediately be removed from service and not returned to service until the cause has been eliminated.

10.7. HIGH TEMPERATURES ON FORKLIFT

When the temperature of a part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle must be removed from service and not returned to service until the cause has been eliminated.

10.8. CLEANING

Industrial trucks must be kept in a clean condition, free of lint, excess oil and grease. Noncombustible agents should be used for cleaning trucks. Only solvents with a flash point at or above 100 degrees F. may be used for cleaning. Precautions regarding toxicity, ventilation and fire hazard must be appropriate for the agent or solvent used.

CENTRAL ARIZONA PROJECT

HAZARD COMMUNICATION PROGRAM

REVISED OCTOBER 1, 2019

1.0 PURPOSE

Central Arizona Project (CAP) has a commitment to provide each of its employees a safe and healthy work environment. When using chemicals to do their work, it is important that workers are aware of the identity and toxic or hazardous properties of those chemicals.

CAP's Hazard Communication Program (HazCom) is designed to provide the employee with the information they need to make informed decisions about safe work practices and to prevent hazardous exposures to workplace chemicals. This program is also designed to meet compliance with federal and state standards on providing a safe and healthful workplace. Implementation of these standards is part of CAP's overall program to provide a safe and healthy work environment.

It is the policy of CAP to ensure that employees know the properties and potential safety and health hazards of the materials which they use or to which they are exposed. Employees who use or may be exposed to potentially hazardous substances or harmful physical agents should be informed about the hazards of those substances or physical agents, trained in the precautions necessary to control exposures, and knowledgeable on what to do if they are accidentally exposed.

2.0 SCOPE

This program applies to all departments that use, handle, or store hazardous chemicals. This program does not apply to any of the following:

- Any hazardous waste regulated by the Solid Waste Disposal Act, amended by the Resource Conservation and Recovery Act of 1976;
- Tobacco or tobacco products;
- Wood or wood products;
- Articles (see Section 4.0);
- Food, drugs, or cosmetics intended for personal consumption by employees while in the workplace; and
- Any product sold at retail.

3.0 PROGRAM COMPONENTS

At CAP Hazard Communication is accomplished through a series of steps which include the following elements:

- Evaluation of chemicals and products prior to purchasing to ensure that they do not contain chemicals that pose a significant risk of adverse health effects during their use;
- Training of new employees and existing staff on CAP's Hazard Communication Program to ensure that personnel understand how to identify the risks of chemicals or products being used and the means by which they can protect themselves from exposures;

- Summary information on each SDS reviewed by the Environmental, Health & Safety (EH&S) Department;
- Computer storage of all SDSs for chemicals and products properly obtained for use at CAP and availability of all SDSs to all CAP employees at any computer terminal throughout the company;
- Specific labeling requirements for chemical containers to ensure that employees know the contents and the health hazards of the products they use; and
- A periodic evaluation of the written program to ensure that it continues to meet the requirements of OSHA and other standards and guidelines in protecting the health and safety of CAP employees.

3.1 Employee Information and Training: There are three separate training issues for CAP employees:

- Train all newly hired personnel on the general requirements of CAP's Hazard Communication Program;
- Site-Specific training given to all employees when they report for duty at their assigned work location. The Site-Specific training will provide a further understanding of the specific chemicals in use at the site, how to find a SDS for the chemical, and where to find the personal protective equipment (PPE) described on the SDS; and
- Training for non-routine work operations such as siphon outages or stator replacements that may involve a one-time use of specific chemicals which may be more hazardous that normally acceptable at CAP.

3.2 Labeling of Chemical Containers: Supervisors are responsible for assuring that the manufacturer/supplier label is not removed or defaced unless it is illegible, inaccurate, or does not conform to CAP's labeling requirements. Supervisors are also responsible for ensuring that secondary containers (see below) are re-labeled when drawn from a primary container.

Supervisors must ensure that labels are legible, in English, and prominently displayed on the container throughout each work shift. The label may include information in another language if that is appropriate.

3.2.1 Labels – Primary Containers: A primary container label is the label provided by the manufacturer or supplier of the product.

3.2.2 Labels – Secondary Containers: A secondary container label is used when the hazardous chemical is transferred from the manufacturer's or supplier's container into a small container for worker use. <u>All</u> secondary containers at CAP must be labeled with at least the name of the hazardous chemical appearing on the SDS and the pertinent physical and health hazards, including the organs that would be affected. This information can be found in the SDS.

Care must be taken when preparing a secondary container label as frequently

the chemical may adversely affect the label during use. If the chemical drips down the side of the container and obscures the label, it must be replaced with a new legible label.

3.3 Safety Data Sheets: Every chemical or product which contains a hazardous chemical must have a SDS on file within the Content Server system at CAP. Chemicals and products are purchased through the Purchasing Department in accordance with CAP's policy on purchases found in the Administrative Section of the Policy Handbook (Purchasing and Fleet Card Program - III.B Hazardous Potential - Restricted).

Purchase of hazardous chemicals using a Purchasing Card is restricted to certain conditions. Those conditions are when:

- It is necessary to meet an immediate operational need; **AND**
- The identical product and brand has been previously purchased for which there is a SDS on file; **OR**
- You obtain the SDS for the product and verbal approval from the Safety and Health and the Environmental Departments prior to its purchase.

Additionally, this section of the Policy Handbook states that "The use of a product for an immediate operational need does not exempt the cardholder from the following:

- Having a SDS available per CAP requirements,
- Use of the correct PPE for the product,
- Correct use of the product per the manufacturer guidelines,
- Proper transportation of the product, and
- Proper disposal of the product and/or its waste.

When a chemical or product is selected for purchase, a copy of the SDS is obtained prior to the purchase. The SDS is submitted in Content Server through the SDS Approval Form Workflow. After review is completed the approval to purchase is then given via the Content Server Workflow. Chemicals cannot be used until this approval process is complete.

If an employee or supervisor finds that a chemical is being used in the workplace and a SDS is not available through Content Server they should notify the EH&S Department and obtain the SDS to be put into the Content Server SDS database for future reference.

4.0 RESPONSIBILITIES

4.1 EH&S Department: The EH&S Department will oversee the written Hazard Communication program including standardization of labeling requirements, accessibility to SDS and chemical hazard information, and employee information and training. The industrial hygienist will also perform the following:

- Review each SDS provided for suggested purchase
- Provide assistance to the various operating groups in obtaining labeling for use on product containers as well as piping systems and other

conveyances of chemicals or products.

- Conduct Hazard Assessments to ensure that the work areas where chemicals/products are used do not present work situations where employees are exposed to hazardous concentrations of chemicals.
- Conduct periodic evaluations of this Hazard Communication Program and ensure updates are implemented to maintain the purpose of the program.

4.2 **Training Administrator:** The Training Administrator of the Centralized Learning and Development Department is responsible to ensure employee training programs are available for employee access and to maintain records on who has received training, dates of training, and training content.

4.3 **Managers and Supervisors:** Managers and supervisors are responsible for ensuring that the Hazard Communication Program is implemented in their areas of responsibility. Duties of managers and supervisors include:

- Ensuring that employees under their supervision (including new hires) understand how to access SDSs in the Content Server system;
- Ensuring that their employees handle hazardous chemicals using appropriate work practices to limit exposures to the lowest possible extent;
- Ensuring that only PPE items identified by the SDS or the Industrial Hygienist are used when handling chemicals or products;
- Ensure that retraining is conducted whenever a new physical (flammability) or health (toxic) hazard is introduced into the work area;
- Ensure that a current inventory of all products requiring a SDS is maintained in Content Server;
- Continually observe work areas to ensure that chemical containers are properly labeled, according to this written program; and
- Reporting any deficiencies in the Hazard Communication Program to the EH&S Department.

4.4 **Purchasing Department:** Purchasing has the responsibility to ensure any request for purchase of chemicals, products with chemical components, or other materials covered under this written program meet the following requirements:

- The purchase request is accompanied by a SDS specific to the request,
- The request has been reviewed by the EH&S Department and a copy of the SDS Approval Workflow (formal approval) is completed before release of the product for use at CAP.

4.5 **Employees:** Each employee has the responsibility to:

- Review SDSs and Chemical Information Sheets before using a product and be aware of the hazards of using the product;
- Use the proper PPE, as listed in the SDS, to protect against over-exposures;
- Dispose of the chemical/product in the manner described in the SDS;

- Report any unsafe conditions of chemical use or incidents of hazardous exposure to their Supervisors;
- Attend or complete any training required under this program.

5.0 PROGRAM EVALUATIONS

The EH&S Department Manager and/or his designees will conduct periodic evaluations of the workplace to ensure that the provisions of this program are being implemented. These evaluations will include regular consultations with employees who handle hazardous chemicals and their supervisors, site inspections to ensure employees can access SDSs, physical examination of personal protective equipment used by employees, and evaluation of containers of chemicals to ensure availability of SDSs and adequate labeling of containers.

6.0 RECORDKEEPING

Copies of the OSHA Hazard Communication standard are kept in the EH&S Department office and are available to all employees who wish to review them. The Hazard Communication Program is also posted on the company's intranet site at Content Server – Safety Resource Manual. All SDSs are maintained in Content Server. Training records will be maintained by Centralized Learning and Development in the CAP Learning Center. These records will be updated as employees are trained or receive refresher training, and as testing is conducted.

7.0 CONTRACTORS AND OUTSIDE VENDORS

Hazardous chemicals used by contractors or vendors in the performance of their work may pose risks to contract employees or to CAP employees or properties. For this reason certain procedures must be followed by both the outside vendor and CAP.

7.1 Contractor Responsibilities: All contractors performing work on CAP property are required to provide the following items before starting work:

- A list of all hazardous chemicals that will be brought on-site;
- A copy of the manufacturer's SDS for each chemical; and
- A Job Safety Analysis (JSA) detailing how each chemical is to be used and what protective measures will be employed to ensure that their workers and CAP personnel are not exposed.

7.2 CAP Responsibilities: To ensure the safety of outside contractors working on CAP property, the contracting agent or Engineering Project Manager will provide the contractors or vendors with the following before they arrive on property.

- A listing of all CAP chemicals with which the contractor may come in contact;
- A copy of CAP's written Hazard Communication Program;
- A description of how the contractor can obtain a copy of a SDS for each chemical or product to which their employees could have exposure.

CAP
CENTRAL ARIZONA PROJECT

HAZARDOUS ENERGY CONTROL PROGRAM

July 2020

Version 2.0

1 INTRODUCTION

1.1 Purpose

The purpose of the Hazardous Energy Control Program (HECP) is to establish coordinated and consistent procedures for controlling hazardous energy and maintaining operational control of a facility's configuration.

This document establishes procedures and operating criteria for the safety of service or maintenance personnel who work on or near any system that produces, uses, or stores hazardous energy. It establishes minimum standards and performance requirements for the control of hazardous energy at all CAP operated facilities.

1.2 Philosophy

Safe work practices take precedence over immediate job production. No job is so important and no service is so urgent that we cannot take the time to perform our work safely.

The following principles are considered basic to the safe operation of the Central Arizona Project's power and water system:

1.2.1 Priorities:

A. Physical safety of the employees and the public.
B. Integrity and reliability of the CAP's power and water system.
C. Protection of equipment.
D. Service to the customer.

1.2.2 Lockout/Tagout Rules

A. Red DANGER tags and Two-Part personal tags are to be considered the same as locks. Locks with tags must be used on devices capable of receiving a lock.
B. Violating a Red Lock, a Red Tag, or a Blue Lock and Two-Part Tag, can kill somebody.
C. Equipment must not be operated, moved, or removed when Red Tags, Red Locks, or Two-Part Tags with Blue Locks are in place.
D. Energy isolation devices capable of being locked must be locked when using hazardous energy control procedures.
E. Use a multi-lock hasp in all cases where an energy isolation device is locked.
F. Equipment must be considered energized until appropriate tests have been performed to verify the equipment is de-energized.
G. NO EMPLOYEE WILL BE REQUIRED TO WORK ON A JOB OR PIECE OF EQUIPMENT THAT THEY CONSIDER UNSAFE. The employee is responsible for requesting additional protection deemed necessary.

1.2.3 Switching

All switching operations must be guided and tested by the following fundamental principles:

A. Start with the correct procedure and follow it exactly.

B. The six basic steps of switching:
    1. Carry the switching program form with you while switching;
    2. Touch or point to the device identification nameplate to verify correct device;
    3. Recheck the switching program form for correct device and sequence;
    4. Verify anticipated device position;
    5. Perform requested action on the device; and
    6. Verify desired device position.

1.3 Hazardous Energy Control Program (HECP)

1.3.1 Related Safety Programs

The Hazardous Energy Control Program (HECP) complies with Central Arizona Project's Safety Resource Manual and Central Arizona Project's Electrical Safety Program.

1.3.2 Roles and Responsibilities

The HECP defines the specific roles and responsibilities for the various job functions described herein. An employee authorization list will be maintained for each facility in the Clearance Log Entry and Tracking system.

1.3.3 Hazardous Energy Control Procedures

The Program establishes Clearances and Specific Hazardous Energy Control Procedures for each facility that are filed in the Hazardous Energy Control Program folder.

1.3.4 Training

Training shall be provided in accordance with Section 3 to ensure that all personnel understand the purpose and function of the Hazardous Energy Control Program (HECP).

1.3.5 Program Review and Revision

This Hazardous Energy Control Program (HECP) will be reviewed every three years by the Electrical Safety Program Administrator's Office, to ensure that the guidelines and procedures herein are adequate for the safe and reliable operation and maintenance of the Central Arizona Project (CAP) power and water system. The reviews will be done along with the Electrical Safety Program review, which coincides with the issuance of the latest revision of NFPA 70E.

1.3.6 Availability

This program shall be available online through the Safety Resource Center.

1.4 Job Hazard Analysis

A Job Hazard Analysis shall be prepared to identify all hazards specific to the work to be performed on equipment. All hazards identified shall be addressed and mitigation techniques identified on the Job Hazard Analysis.

When the Job Hazard Analysis identifies sources of hazardous energy, a Lockout/Tagout Procedure shall be implemented to establish a safe working condition.

1.5 Types of Lockout/Tagout

There are three types of lockout/tagout:

1.5.1 Simple Lockout/Tagout (Single Source)

Applies to single sources of hazardous energy, under 600 volts, uses a blue lock and two-part tag on the isolation device with no written procedure required. This application is approved and administered locally by authorized personnel.

1.5.2 Specific Energy Control Procedure

Applies to multiple sources of hazardous energy, under 600 volts, uses red locks and red tags on the isolation devices and requires a written procedure. This application is approved and administered locally by authorized personnel.

1.5.3 Clearance

Applies to single and multiple sources of hazardous energy, over 600 volts, engulfment hazards. Requires a written procedure and is approved and administered by Water Control, Electrical Safety Administration and local authorized personnel.

1.6 Interpretations

The stated interpretations for the following words shall be applied throughout this Hazardous Energy Control Program Manual.

"Must"	Mandatory
"Shall"	Mandatory
"Should"	Advisory
"May"	Permissive choice
"Will"	Mandatory, but allowing the employee or party some discretion as to when, where, or how.

As used in this Hazardous Energy Control Program Manual, the pronouns "he,' "his," and "himself" refer to a specific individual or position that might be "she," "her," or "herself" in a given circumstance. Also used in this context is the term "Switchman".

1.7 Emergencies

In an emergency (see Section 19 Definitions), authorized employees may suspend general switching requirements temporarily as necessary to permit proper handling of the specific emergency. However, in handling such emergencies, safety of personnel shall be the first priority.

1.8 Document Retention

Clearances and Two-Part tags are retained for five years. Electrical Safety Program Administrators are responsible for collecting the documents and sending them to Records Management for storage. Area Supervisors are responsible for providing storage receptacles and binders for these documents at their facilities.

1.9 References

Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910.147 https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.147

Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910.269 https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.269

Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910, Subpart S https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910SubpartS

Reclamation Facilities, Instructions, Standards and Techniques
FIST Volumes: https://www.usbr.gov/power/data/fist_pub.html

- *Volume 1-1 Hazardous Energy Control Program*

- *Volume 5-1 Personal Protective Grounding*

- *Volume 3-29 Energized Facility Maintenance*

2 RESPONSIBILITY AND AUTHORITY

2.1 Programmatic Responsibilities

2.1.1 Maintenance Managers

The maintenance manager for each facility shall ensure that the requirements of this Hazardous Energy Control Program are:

a. Properly applied;
b. Strictly adhered to; and
c. Understood by all affected employees.

2.1.2 Safety Department

a. Responsible for compliance of the Lockout/Tagout procedure.
b. Verifies that the HECP meets or exceeds OSHA requirements.
c. May provide assistance to the Electrical Safety Program Administrator in performing periodic annual audits.

2.1.3 Engineering and Contracts

Ensure the specification section of contracts issued contain references to the applicable OSHA Lockout/Tagout Standards.

2.1.4 Purchasing Department

Assures that outside contractors submit copies of the contractor's safety program for review to the Safety Department.

2.2 Functional Responsibilities

2.2.1 Training Administrator

a. Maintains employee safety-related training records.
b. Tracks HECP retraining intervals to maintain compliance with training requirements.
c. Administers web-based training for the HECP.

2.2.2 Maintenance Supervisors

Maintenance supervisors authorize their employees to perform switching, hold clearances and SECP's at their facilities. Authorized Employees are on a list maintained by Electrical Safety Administrators in Clearance Log Entry and Tracking (CLEAT). They are responsible for any emergency switching that is assigned to personnel in emergency situations as described in Section 1.7.

2.2.3 Water Control Supervisor

Water Control Supervisor approves outage requests, internal and external; approves dive requests and manages special work permits for dives, and may be responsible for emergency switching as described in Section 1.7.

2.2.4 Water Control Dispatcher

Water Control Dispatcher issues clearances, logs actions and applies SCADA status tags to equipment control displays. Also issues interconnected system clearances and accepts external interconnected system clearances. Gives "no backfeed" assurance for hot line orders on interconnected systems.

2.2.5 Electrical Safety Program Administrator

a. Administers, maintains, and revises the Lockout/Tagout procedures where required.
b. Maintains locks for all facilities.
c. Identify, generate, and maintain equipment-specific written procedures as required.
d. Conducts annual audits of activity within HECP.
e. Provides guidance and feedback to Authorized Employees regarding HECP procedures.

2.2.6 CAP Representative

Monitors contractor work performed within a lockout/tagout procedure. Discusses the protection provided with the contractor to assure its adequacy and defines the perimeter and conditions of the safe working area. Prepares the Special Work Permit form.

2.2.7 Job Supervisor

An Authorized Employee who requests, receives, and releases clearances and specific energy control procedures. He may act as the CAP Representative for special work permits. Job Supervisors must have the knowledge and skills necessary for the safe application, use, and removal of hazardous energy control procedures. A Job Supervisor assumes responsibility for the lockout/tagout procedure. "Job Supervisor" is an HECP function. A Job Supervisor is not associated with the management or supervision of personnel.

2.2.8 Switchman

An Authorized Employee designated by the maintenance supervisor, based on his knowledge of the equipment and procedures in his area of responsibility, to perform switching for lockout/tagout or reconfiguring facility systems. A switchman can be a mechanic or an electrician.

2.2.9 High Voltage Switchman

An Authorized Employee designated by his Area Supervisor, based on his knowledge of the equipment and procedures in his area of responsibility, to

perform switching on electrical systems rated 600 volts or greater. He is not required to be the Job Supervisor on clearances he has placed.

2.2.10 Worker

An Affected Employee who places a personal lock and tag with the permission of the Job Supervisor, and works within a lockout/tagout procedure. The Worker is responsible for understanding the protection provided by the lockout/tagout procedure and maintaining control of the key to their personal lock.

3 TRAINING

3.1 Purpose

Ensure that all CAP employees involved with the HECP have an understanding that is appropriate for their level of hazardous energy exposure.

3.2 Requirements

Training shall be provided to ensure that the purpose and procedures of the Hazardous Energy Control Program (HECP) are understood by all Affected Employees and that Authorized Employees possess the specific knowledge and skills required for the safe application, use, and removal of energy controls.

Training consists of classroom (4 hrs), online through the CAP Learning Center, and on the job.

3.3 Incidental Employees

New employee orientation training: Electrical Safety Awareness parts 1 and 2; and Hazardous Energy Control Program Awareness all within 90 days.
Refresher training: Electrical Safety Awareness part 2 and Hazardous Energy Control Program Awareness refreshed every 3 years. These are all web-based training courses through the CAP Learning Center.

3.4 Affected Employees

New employee orientation training for Affected Employees: Hazardous Energy Control Program Introduction Powerpoint presentation. This presentation provides sufficient training to allow Affected employees to work under a lockout/tagout procedure.
Refresher training for Affected Employees: HECP Affected parts 1 & 2 web-based training, refreshed every 3 years.

3.5 Authorized Employees (HECP Instructor-led Training)

Authorized Employees receive instructor led training which consists of classroom and on the job instruction. Employees are designated as Authorized by their supervisor based on their demonstrated understanding of the facility systems and application of lockout/tagout procedures. New hires are designated as Affected. CAP policy requires at least 9 months of job experience to qualify as Authorized.

3.5.1 Classroom Training

Each Authorized Employee shall receive classroom training in the recognition of hazardous energy sources, lockout/tagout equipment, and the methods and means for energy isolation and control. Affected employees transitioning to Authorized employees will attend the classroom training and thereafter be

tracked as authorized in the CAP Learning Center. Refresher training is received every three years.

3.5.2 On the Job Training

Each Authorized Employee shall receive on the job training on the type and magnitude of hazardous energy in the facilities the employee is responsible for and the operation of the systems and isolating devices therein.

3.6 Retraining

Affected and Authorized Employees are required to be retrained before the scheduled refresher training if any of the following conditions exist:

3.6.1 On the Job Retraining

A. New technology, new types of equipment, or changes in procedures necessitate the use of work practices different from those that the employee would normally use.
B. The employee's job assignments change.

3.6.2 HECP Classroom Retraining

A. The supervision or annual audits indicate the employee is not complying with lockout/tagout procedures.
B. HECP processes are changed.
C. The employee needs to review tasks that are not normally performed during regular job duties.
D. Any safety violations, close call or near miss incidents have occurred.

3.7 Training Documentation

HECP training records for each employee are maintained by the Training Administrator.

4 FIELD WORK AUDITS

Annual audits shall be conducted to ensure that the Hazardous Energy Control Procedures are implemented properly, that the employees involved are familiar with their responsibilities under those procedures, and that employees maintain proficiency in, and follow the Hazardous Energy Control Procedures. These audits shall include a sampling of the Hazardous Energy Control Procedures in-process at the facility and visual observations of the process to determine compliance.

4.1 Responsibility

The audits shall be performed by an Electrical Safety Administrator. The auditor must be able to determine whether the steps in the Hazardous Energy Control Procedures are being followed, whether the employees involved know their responsibilities under the procedures, whether the procedures are adequate to provide the necessary protection, and what changes, if any, are needed. The auditor may observe and discuss responsibilities with employees individually or in a group setting.

4.2 Documentation

Audits are documented using the HECP Annual Audit Form. Completed audits are filed in Content Server here.

4.3 Deficiencies

Any deficiencies shall be documented on the audit report and corrective action conducted to ensure future compliance. Corrective actions are also documented on the form.

5 LOCKOUT AND TAGOUT DEVICES

5.1 Locks and Tags

5.1.1 BLUE Personal Locks and Two-Part Tags

A. Blue locks are used for personal protection only. Provides the worker exclusive control of the system being worked on.
B. Used on energy isolation devices that are capable of being locked out for simple lockout/tagout procedures.
C. Used on red lock boxes for clearances and specific energy control procedures.
D. Be a uniquely keyed lock with a single key controlled by the protected worker.
E. The key is retained when the lock is open.
F. The Blue lock must always be accompanied by the upper portion of the Two-Part tag.

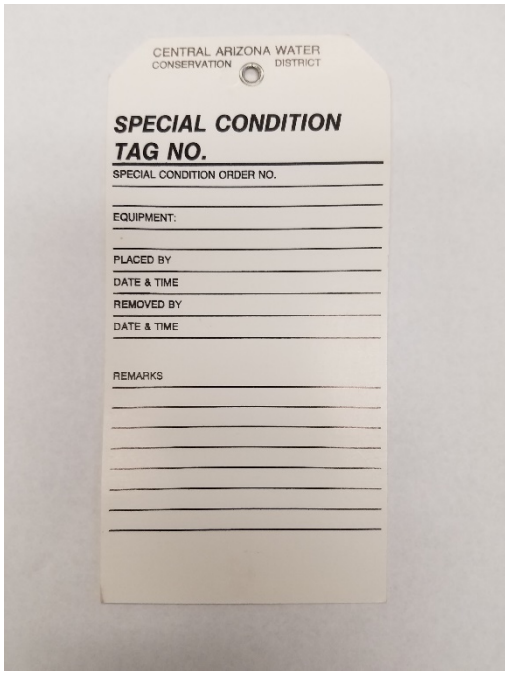
5.1.2 RED locks and Danger Tags

A. Red locks are used on energy isolation devices to establish the perimeter of a clearance or specific energy control procedure.
B. Red locks are grouped in lock boxes and share the same key.
C. Red locks are always accompanied by a Red Danger tag.
D. Danger tags may be used alone if no locking means available.
E. Lock Box contains the key for the group of red locks and provides the means for securing the key by attaching blue personal locks.

5.1.3 GOLD Locks and Out of Service Tags

A. Gold locks are used to protect equipment.
B. Gold locks are never used to protect people.
C. May be accompanied by an Out of Service tag.
D. Tag may be used alone if no locking means available.
E. Gold locks share a common key.

5.2 Special Condition Tag



A. Used to indicate temporary special operating or limiting instructions.
B. May be used to protect operational equipment.
C. Never used for personnel protection.

5.3 Multi-Lock Hasps

Use multi-lock hasps to apply locks to all energy isolating devices capable of being locked.

5.4 Locking Devices

Locking devices such as valve operator handle covers, chains, cables, breaker handle locks and similar devices are used as needed to facilitate locking of energy isolating devices or locking multiple lock boxes (to reduce the number of personal locks) . These devices are manufactured for this purpose.

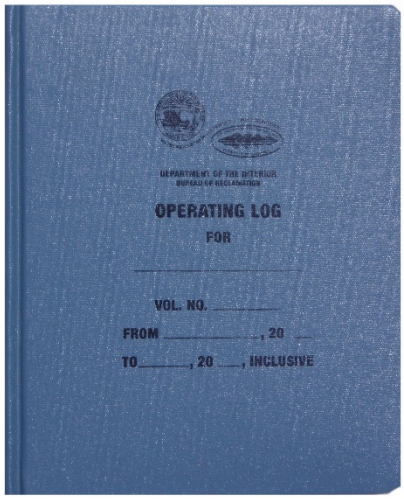
Other devices such as blocks are used to restrain mechanical or stored energy.

Locking devices fabricated for specific needs must be approved by the Safety department before use.

6 STATION LOG BOOKS AND LOG ENTRIES

All hazardous energy control procedures described in this program, with the exception of simple lockout/tagout, must be documented in the station log books as described below. Log book entries must be stamped or legibly printed by hand in black ink. Entries shall be made as soon as possible after the action has been accomplished. The name of the person making entries shall appear in the log. In the event that an error is made on an entry, line out the mistake, initial it, and make a new entry below. Do not erase, black out or white out the mistaken entry.

6.1 Station Operating Log (Blue Book)

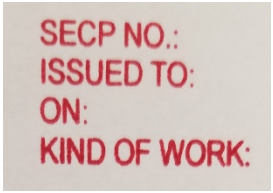


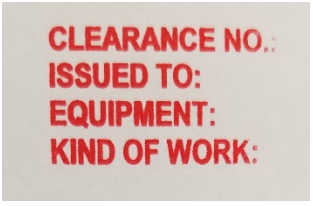
6.1.1 Purpose

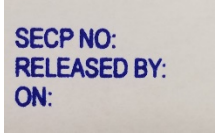
Operational information such as daily plant status, events, alarms, trouble calls, troubleshooting details, repairs, general switching, SECP's, clearances, special conditions, special work permits, out of service, personal protective grounds placement and removal, and supervisory lock removal are entered in the station operating log. The operating log book is available from the warehouse, stock # 1301-0025.

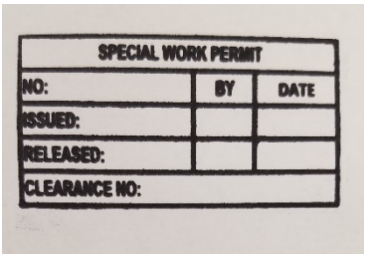
6.1.2 Logging HEC Procedures

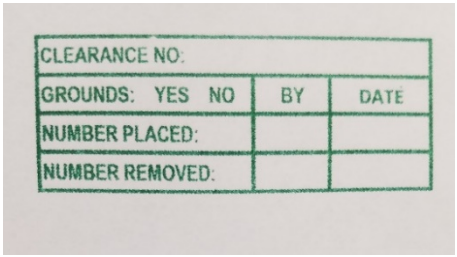
After an SECP, clearance or special work permit is issued or released, or grounds placed or removed, the action shall be logged using the appropriate colored stamp and filling in the blank fields using black ink. Approved stamps are shown below:







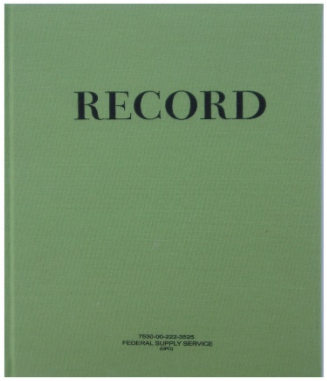




If no stamp is available, print the stamp text with the appropriate color ink and fill in the fields with black ink.

Log special conditions, general switching and out of service conditions with black ink and include this information: Sequence number, Equipment, Date of Action and Placed by.

6.2 Plant Record Log (Green Book)



6.2.1 Purpose

The Plant Record Log is used to record HEC procedures in sequence so as to maintain the sequence numbering scheme for each type. This log provides a summary of the activity at the plant.

6.2.2 Logging Procedures

The following procedures are logged in the Plant Record Log:
Clearances
Specific Energy Control Procedures
General Switching
Special Work Permits
Out of Service
Special Conditions
Lifted Wires

The log is printed with sections for each type of procedure and the information to be logged. In general, the information includes the sequence number, the date issued, issued by, equipment and date released. Use black ink to fill in the information.

7 GENERAL SWITCHING

7.1 Application

General switching is performed when changing the position and status of high voltage electrical systems and devices.
General switching includes changes for:

a. Emergencies;
b. Maintenance;
c. Preparation for placing a clearance;
d. Testing;

e. Changes in operating conditions; and
f. Restoration to normal operating conditions.

7.2 Procedures

A switching program form shall be prepared for each application of general switching. Standard switching procedures for typical general switching requirements are available in Content Server. Any deviations from the typical switching procedure will need to be written and approved by the Area Supervisor or the Electrical Safety Program Administrator. A high voltage switchman will perform the general switching procedure as directed by the Area Supervisor and/or Electrical Safety Program Administrator. Locks and tags are not required for general switching. Refer to paragraph 7.3 below for rules pertaining to switching.

Completed switching program forms are filed at the facility and entered in the station log books.

7.3 Rules for Performing Switching

Start with the correct procedure and follow it exactly.

7.3.1 The Six Basic Steps of Switching

1. Carry the switching program form with you while switching;
2. Touch or point to the device identification nameplate to verify correct device;
3. Recheck the switching program form for correct device and sequence;
4. Verify anticipated device position;
5. Perform requested action on the device; and
6. Verify desired device position.

7.3.2 Verifying Device Position

a. Visually confirm all phases of a disconnect switch are fully opened or fully closed.
b. Check the operation indicators and disconnect blades for correct position on all phases of interrupter switches.
c. Check the position indicators on power circuit breakers for correct position, do not rely on indicating lights alone.
d. Assure motor operators are de-coupled and locked on motor-operated disconnect switches.
e. Assure manual operating handles are disabled or blocked and locked.

7.3.3 Stopping a Switching Procedure

The Switchman must stop, proceed no further, and consult with the Electrical Safety Program Administrator if any of the following conditions are encountered:

a. The instruction is not clearly understood;
b. The instruction appears to be incorrect;
c. An unexpected protective relay, breaker or other action occurs;
d. A device is found in a position other than indicated on the switching program form.
e. It is determined that by performing a step, a dangerous condition could result.

Switching may proceed only after the corrected switching steps have been approved by the Administrator, Area Supervisor and the Switchman.

7.3.4 Switching Capacitor Banks

a. At least 5 minutes must elapse between the de-energizing of a capacitor bank and the closing of its ground switch.
b. A capacitor bank must remain de-energized for at least 5 minutes before it is re-energized.
c. An additional 5 minutes must be allowed after the ground switch is closed before issuing a clearance permitting personal protective grounds to be installed.
d. The time required in c. above must be explicitly expressed on the switching program form.

8 SIMPLE LOCKOUT/TAGOUT PROCEDURE

8.1 Application

Simple lockout/tagout procedure is used when the following elements exist:

a. The equipment has a single energy source that can be readily identified and isolated; and
b. The isolation and locking out of that energy source will completely de-energize and deactivate the equipment; and
c. If the energy source is electrical, it must be less than 600 volts; and
d. The single hazard is not from engulfment in a confined space.

A written procedure is not required for simple lockout/tagout.

8.2 Procedure

8.2.1 Placing lockout/tagout:

An authorized switchman must place the lockout/tagout.

a. Complete a Job Hazard Analysis (JHA) indicating a single source of hazardous energy exists.
b. Perform a normal shutdown of the equipment.
c. Operate the energy isolating device. Verify desired position of energy isolating device.
d. Use a multi-lock hasp on the energy isolating device if it will allow it. Apply a personal blue lock and two-part danger tag. Write “single source” on the tag where the clearance number is to be entered. A multi-lock hasp is recommended to allow multiple personal blue locks to be applied.
e. If the isolating device will not hold multiple locks, a single red lock may be used and personal blue locks applied to the lock box.
f. If the energy isolating device will not hold a lock, a single two-part danger tag may be used without the personal blue lock. Only one worker may work on the equipment in this case.
g. After applying lockout/tagout, verify absence of voltage or energy source has been blocked, restrained, relieved, disconnected or otherwise rendered safe.

8.2.2 Removing lockout/tagout:

a. After work is complete, prepare the equipment for operation by assuring covers are on, doors are closed, control settings are restored to normal, etc.
b. Remove the lock(s) and tag(s).
c. Operate the energy isolating device. Verify desired position.
d. If possible, perform a functional test to verify the equipment is working.

e. Return the lock to the lock cabinet and staple the two part tag together. Drop it in the tag receptacle.

8.2.3 Motor Room CO_2 System lockout/tagout:

For the purpose of performing routine visual inspections or operational check inside the motor rooms, use the following procedure:

a. Close the initial and delayed discharge valves for the unit motor room to be entered. The valves are clearly labeled with engraved plastic tags.
b. Lockout/tagout both valves using the blue personal locks and tags stored at the system. If a second person is entering the space, a second set of personal blue locks and two-part tags must be used with a lock multiplier on the valves.
c. Enter the motor room and perform the inspection.
d. Exit the motor room and assure the doors are closed and locked.
e. Assure there is not an alarm active on the system. If so, verify CO_2 has not been released and determine cause of alarm.
f. Remove the locks and tags from the initial and delayed discharge valves and leave them at the system.
g. Open the initial and delayed discharge valves.

9 SPECIFIC ENERGY CONTROL PROCEDURE

9.1 Application:

A specific energy control procedure (SECP) is a formalized and documented hazardous energy control process which allows workers to safely perform their assigned tasks. The SECP is a written procedure documenting the steps taken to isolate specific equipment or systems from sources of hazardous energy. SECP's are used when the following elements exist:

a. There are multiple hazardous energy sources (complex lockout/tagout); and
b. The procedure requires switching of equipment rated less than 600 volts; and
c. There is no hazard from engulfment in a confined space.

Note that an outage request may need to be approved by Water Control if the system to be worked on affects aqueduct or turnout capacity.

9.2 Procedure for using an SECP

a. The Job Supervisor references system drawings and standard operating procedures to prepare a Job Hazard Analysis that identifies all sources of hazardous energy, and has determined that an SECP is required.
b. An outage request workflow may be required and is initiated by the planner and sent to the Area Supervisor, then to Water Control for approval. Refer to Section 14 for details on the outage request process.
c. A pre-approved SECP for common tasks can be found in the facility Hazardous Energy Control folder in Content Server.
d. If a pre-approved SECP is not available, one must be created using either the blank SECP form or editing an existing pre-approved procedure.
e. The completed SECP document is reviewed and approved by all workers on the job. It contains a step-by-step procedure that includes the following:
    1. Instructions to operate each hazardous energy isolation device to its desired position.

2. Instructions to place lockout/tagout to each hazardous energy isolation device after its position has been verified.
3. Instructions to relieve any stored energy that might endanger personnel.
4. Instructions to remove lockout/tagout and restore the energy isolating devices to a desired state.

This review should be documented on the JHA/PJB pre-job brief section.

9.3 Placing the SECP

An Authorized Switchman must place the specific energy control procedure.

a. Perform a normal shutdown of the equipment.
b. Perform each step on the Switching for Placement (SFP) instructions.
c. Record initials, time, and date for each completed step.
d. The Job Supervisor "walks down" the SECP (verifies switching is correct) if he did not witness or perform the switching.
e. Job Supervisor performs appropriate tests to verify isolation and de-energization of the equipment (or system) and verifies stored energy has been released.
f. Job Supervisor secures the lock set key(s) in the red lock box and places his blue lock and tag on the lock box latch.
g. The Job Supervisor records his name, time and date under "Procedure Issued To" on the form.
h. The SECP form is placed in a plastic sleeve and tie wrapped or locked to the red lock box.
i. Log the issuing of the SECP in the Operating and Record log books.
j. Placement and removal of personal protective grounds (PPG) is documented on the SECP form and entered in the Operating Log. This is not common for SECP's. Removal of PPG is required prior to releasing the SECP.

9.4 Working Under an SECP

a. After verifying the adequacy of the protection with the Job Supervisor, all workers apply their personal blue locks and tags to the lock box. All workers will be afforded the opportunity to walk down the SECP and request additional necessary protection.
b. Prior to placing a personal lock on an existing SECP, the worker(s) shall inform the Job Supervisor, a pre-job briefing conducted and documented on the JHA/PJB form as a re-brief. The Job Supervisor then grants permission to place lock(s) and work within the SECP.
c. In the event of any changes to the working conditions or status of the equipment, the Job Supervisor will conduct a re-brief advising the workers of the changes.
d. Workers must advise the Job Supervisor immediately if a device is found in a position other than indicated on the SFP instructions; or a dangerous condition exists.

9.5 Personal (Blue) Lock Removal

Each worker is responsible for control of the key to his personal blue lock. When his work is completed, he removes his lock and tag from the red lockbox, returns the lock and key to the yellow lock cabinet, staples the two part tag together and deposits it in the tag receptacle.

Employees should be cognizant of their schedule and avoid leaving their lock in place when no longer working under that SECP. If the employee is not available to personally remove the lock, he may initiate the lock removal process by:

a. Contacting the Area Supervisor to advise that he intends to have his personal lock removed from an SECP and will be sending his personal lock key.
b. Area Supervisor receives the personal lock key and completes the process by removing the lock and tag from the clearance box and placing them in the lock cabinet and tag receptacle, respectively.
c. Alternatively, the Area Supervisor can initiate the process by contacting the employee and requesting that he send his personal lock key.

If the personal lock key has not been relinquished and is not available, the Supervisor Lock Removal Procedure must be followed.

9.6 Removing the SECP

Following completion of the work, the Job Supervisor assures the equipment is prepared for operation: covers are on, doors are closed, control settings are restored to normal, tools and materials accounted for, etc. and all workers have removed their personal locks and tags.

a. Job Supervisor removes his personal lock from the lock box and records his name, time and date under “Procedure Released By”.
b. An authorized worker performs each step on the Switching for Removal form, recording his initials, time, and date for each completed step.
c. If possible, after switching for removal is complete, perform a functional test to verify the equipment is working.
d. Job Supervisor informs Water Control the equipment is back in service (if applicable).
e. Job Supervisor records the SECP release in the Operating and Record log books.

9.7 Transferring an SECP

If the Job Supervisor holding an SECP plans to leave the facility for an extended period of time, or otherwise needs to transfer his responsibility to another Job Supervisor, he must report to the Area Supervisor and state his intention. The process to transfer an SECP is:

a. The Area Supervisor designates a second Job Supervisor or himself to assume responsibility for the SECP.
b. The second Job Supervisor is issued the existing SECP. This is documented on the same SECP form. PPG placements remain, Special Work Permits are still active, workers personal locks remain in place and work continues under the SECP. The second Job Supervisor assumes responsibility for everything under the SECP.
c. The first Job Supervisor releases the SECP and removes his personal lock and tag.
d. The second Job Supervisor places his personal lock on the lock box latch.

9.8 Transfer SECP Under Abnormal Conditions

In the event that the Job Supervisor becomes unavailable and can no longer be responsible for the SECP, the process is as follows:

a. The Job Supervisor’s supervisor shall make all reasonable efforts to contact him and inform him that the SECP will be transferred and he will be released as the Job Supervisor.
b. The Job Supervisor’s supervisor designates a second Job Supervisor or himself to assume responsibility for the SECP.

c. The SECP is transferred to the new Job Supervisor per the process described in section 9.6.
d. Next, the Supervisor Lock Removal process (Section 11) is initiated to remove the original Job Supervisor's personal lock and tag.
e. After completing the lock removal process, the new Job Supervisor places his personal lock and tag on the lock box latch to complete the transfer and assume all responsibilities.
f. If the original Job Supervisor was not able to be contacted regarding the transfer, he must be informed by his supervisor as soon as possible upon returning to work.

10 CLEARANCES

10.1 Application

A Clearance is a formalized and documented hazardous energy control process which allows workers to safely perform their assigned tasks. The clearance is a written procedure documenting the steps taken to isolate specific equipment or systems from sources of hazardous energy. Clearances should not be used as an out of service condition when no work is being performed. Clearances are used when at least one of the following elements exist:

a. The procedure requires switching of equipment rated greater than or equal to 600 volts; or
b. There is a hazard from engulfment in a confined space.

Note that an outage request will need to be approved by Water Control if the system to be worked on affects aqueduct or turnout capacity.

10.2 Clearance Procedure

a. The Job Supervisor references system drawings and standard operating procedures to prepare a Job Hazard Analysis that identifies all sources of hazardous energy, and has determined that a clearance is required.
b. An outage request workflow is initiated by the planner and sent to the area supervisor then to Water Control for approval. Refer to Section 14 for details on the outage request process.
c. If approved, Electrical Safety Program Administration or Water Control drafts the clearance procedure.
d. The draft clearance is saved in Content Server and linked to CLEAT (Clearance Log Entry and Tracking). A unique sequence number is automatically created at that time.
e. Job Supervisor and all workers review the draft clearance procedure. Needed edits are made by Electrical Safety Program Admininistrator or Water Control.
f. The completed clearance document is reviewed and approved by all workers on the job. It contains a step-by-step procedure that includes the following:
    1. Instructions to operate each hazardous energy isolation device to its desired position.
    2. Instructions to place lockout/tagout to each hazardous energy isolation device after its position has been verified.
    3. Instructions to relieve any stored energy that might endanger personnel.
    4. Instructions to remove lockout/tagout and restore the energy isolating devices to a desired state.

This review should be documented on the JHA/PJB pre-job brief section.

10.3 Placing the Clearance

An Authorized Switchman must place the clearance. If the placement requires switching equipment rated 600 volts or greater, an Authorized High Voltage Switchman must perform those steps.

a. Perform a normal shutdown of the equipment.
b. Perform each step on the Switching for Placement (SFP) form.
c. Record initials, time, and date for each completed step.
d. The Job Supervisor "walks down" the clearance (verifies switching is correct) if he did not witness or perform the switching.
e. Job Supervisor performs appropriate tests to verify isolation and de-energization of accessible equipment and verifies stored energy has been released.
f. The Job Supervisor secures the lock set key(s) in the red lock box and places his blue lock and tag on the lock box latch.
g. The Job Supervisor calls Water Control to be issued the clearance. He then records his name under "Procedure Issued To", the Water Control Dispatcher's name under "Procedure Issued By", the time and date on the clearance form.
h. The clearance form is placed in a plastic sleeve and tie wrapped or locked to the red lock box.
i. Log the issuing of the clearance in the Operating and Record log books. The Water control dispatcher logs the issuance in CLEAT.
j. Placement and removal of personal protective grounds (PPG) is documented on the clearance form, and in CLEAT and entered in the Operating Log. Removal or Transfer of PPG is required prior to releasing the clearance.

10.4 Working Under the Clearance

a. Job Supervisor performs appropriate tests to verify isolation and de-energization of equipment that was not accessible prior to the clearance being issued.
b. After verifying the adequacy of the protection with the Job Supervisor, all workers apply their personal blue locks and tags to the lock box. All workers will be afforded the opportunity to walk down the clearance
c. Prior to placing a personal lock on an existing clearance, the worker(s) shall inform the job supervisor, a pre-job briefing conducted and documented on the JHA/PJB form as a re-brief. The Job Supervisor then grants permission to place lock(s) and work within the clearance.
d. In the event of any changes to the working conditions or status of the equipment, the Job Supervisor will conduct a re-brief advising the workers of the changes.
e. Workers must maintain awareness of the protection perimeter while working.
f. Workers must advise the Job Supervisor immediately if a device is found in a position other than indicated on the SFP; or a dangerous condition exists.

10.5 Personal (Blue) Lock Removal

Each worker is responsible for control of the key to his personal blue lock. When his work is completed, he removes his lock and tag from the red lockbox, returns the lock and key to the yellow lock cabinet, staples the two part tag together and deposits it in the tag receptacle.

Employees should be cognizant of their schedule and avoid leaving their lock in place when no longer working under that clearance. If the employee is not available to personally remove the lock, he may initiate the lock removal process by:

a. Contacting the Area Supervisor to advise that he intends to have his personal lock removed from a clearance and will be sending his personal lock key.
b. Area supervisor receives the personal lock key and completes the process by removing the lock and tag from the clearance box and placing them in the lock cabinet and tag receptacle, respectively.
c. Alternatively, the Area Supervisor can initiate the process by contacting the employee and requesting that he send his personal lock key.

If the personal lock key has not been relinquished and is not available, the Supervisor Lock Removal Procedure must be followed.

10.6 Removing the Clearance

Following completion of the work, the Job Supervisor assures personal protective grounds have been removed or transferred, the equipment is prepared for operation: covers are on, doors are closed, tools and materials accounted for, etc. and all workers have removed their personal locks and tags.

a. Job Supervisor calls Water Control, verifies that all workmen are clear, Special Work Permits released or transferred, PPG removed or transferred, and releases the clearance to the operator. He documents this under “Clearance Released By” and “Clearance Released To”, time and date. Water control dispatcher records release in CLEAT.
b. Job Supervisor removes his personal lock from the lock box.
c. The Job Supervisor or other authorized switchman performs each step on the Switching for Removal form, recording initials, time, and date for each completed step.
d. Job Supervisor records the clearance release in the Operating and Record log books.
e. In most cases, a major or minor walkthrough, as found in the plant SOP, is required to verify the equipment is ready to be returned to service.
f. Job Supervisor informs Water Control the equipment is available.

10.7 Transferring a Clearance (Identical Clearance)

If the Job Supervisor holding a clearance plans to leave the facility for an extended period of time, or otherwise needs to transfer his responsibility to another Job Supervisor, he must report to the Area supervisor and state his intention. The process to transfer a clearance is:

a. The Area Supervisor designates a second Job Supervisor or himself to assume responsibility for the clearance.
b. The second Job Supervisor requests and is issued an identical clearance from Water Control. The original clearance is numbered CCYEAR - SEQ# - 0, the identical clearance is numbered -1. This is documented on the same clearance form. PPG placements remain, Special Work Permits are still active, workers personal locks remain in place and work continues under clearance -1. The second Job Supervisor assumes responsibility for everything under the original clearance.
c. The first Job Supervisor releases the original clearance immediately following issuance of the identical clearance. The release is accomplished the same way as a normal release with the exception that Water Control does not require him to confirm workmen are clear, PPG removed and Special Work Permits released. Responsibility for these was transferred to the new Job Supervisor in the previous step. He removes his personal lock and tag.

d. The second Job Supervisor places his personal lock and tag on the lock box latch.

10.8 Transfer Under Abnormal Conditions (Identical Clearance)

In the event that the Job Supervisor becomes unavailable and can no longer be responsible for the clearance, the process is as follows:

a. The Job Supervisor's supervisor shall make all reasonable efforts to contact him and inform him that the clearance will be transferred and he will be released as the Job Supervisor.
b. The Job Supervisor's supervisor designates a second Job Supervisor or himself to assume responsibility for the clearance.
c. The clearance is transferred to the new Job Supervisor per the process described in section 10.7.
d. If the original Job Supervisor can be contacted, he releases the clearance per the process described in section 10.7.
e. If the original Job Supervisor is unavailable, his supervisor contacts Water Control to accomplish the release.
f. Next, the Supervisor Lock Removal Process (Section 11) is initiated to remove the original Job Supervisor's personal lock and tag.
g. After completing the lock removal process, the new Job Supervisor places his personal lock and tag on the lock box latch to complete the transfer and assume all responsibilities.
h. If the original Job Supervisor was not able to be contacted regarding the transfer, he must be informed by his supervisor as soon as possible upon returning to work.

10.9 Change of Protection Perimeter

This procedure only applies to situations where the worksite must remain isolated from hazardous energy but the protection perimeter is changed.

The procedure to change the protection perimeter is as follows:

a. The Job Supervisor references system drawings and standard operating procedures to prepare a Job Hazard Analysis that identifies all sources of hazardous energy, and has determined that a change in the protection perimeter is required.
b. Electrical Safety Program Administrator drafts the clearance procedure per the Job Supervisor's request.
c. The draft clearance procedure is reviewed and approved by the Job Supervisor and his workers.
d. Electrical Safety Program Administrator edits the Switching for Removal steps on the existing clearance to indicate lock and tag removal only on the energy isolating devices that will remain under the new clearance. Job Supervisor reviews and approves edits.
e. New clearance is placed using new locks and tags. Water Control issues it to the Job Supervisor.
f. If personal protective grounds are in place, the Job Supervisor documents the transfer by entering the new clearance number in the Removed or Transferred box on the original clearance form. He documents the placement of the grounds on the new clearance form. Both actions are logged in the plant operating log and in CLEAT.
g. If a Special Work Permit has been issued, the Job Supervisor documents its transfer to the new clearance. This is described in Section 13.

h. Workmen transfer their personal locks with new tags to the new clearance.
i. Job Supervisor releases the original clearance to Water Control.
j. Original clearance is removed using edited Switching for Removal.

10.10 Tests and Operation of Equipment within the Perimeter of a Clearance

Equipment that is not locked or tagged may be operated within the perimeter of the clearance. The Job Supervisor is responsible for seeing that the equipment is safe to operate, workers are aware it is being operated and are in the clear.

Test equipment that is a source of hazardous energy (such as Doble testing) may be used within the perimeter of the clearance. Prior to starting testing:

a. Obtain permission from the Job Supervisor to conduct the tests.
b. Job Supervisor assures workers are informed of the equipment to be energized and are clear.
c. If personal protective grounds must be relocated, this must be documented on the clearance form and in the Operating Log.
d. Barricade the area around the equipment to be tested.
e. At least two people are required to conduct Doble tests and monitor the area while testing is underway. A single worker may perform other types of testing if he has complete control of the area exposed to hazardous energy.
f. After testing is completed, assure equipment is de-energized before removing barricades.
g. Inform Job Supervisor testing is completed.

11 SUPERVISOR LOCK REMOVAL

11.1 Application

The Job Supervisor should monitor the workers' schedules to avoid needing to remove a lock left by an absent worker. Workers should also be cognizant of their schedules and avoid leaving a lock in place when no longer working under that clearance. A worker who discovers he has left a lock on after leaving the site should be proactive and contact the Job Supervisor and the supervisor of the lock to affirm that his lock may be removed and that he will be sending the key. The Supervisor Lock Removal Process must be followed when all of the following conditions exist:

a. Work under the LO/TO procedure has been completed and;
b. The worker with a personal lock applied to the LO/TO procedure is unavailable and;
c. The system needs to be returned to service and cannot be delayed to obtain the worker's personal key.

Each plant and group of checks and turnouts has a master key for the personal locks assigned to the facilities. The supervisor who owns the locks is responsible for securing and maintaining exclusive control of the master key(s). The master key may only be used to remove a personal lock after the approval process is completed. A copy of each master key is kept by Electrical Safety Administration.

11.2 Procedure

a. The Job Supervisor contacts the supervisor in charge of the lock to advise that a personal lock belonging to an individual who is unavailable requires removal.

b. The supervisor in charge of the lock contacts the individual's supervisor to request approval to remove the lock.
c. The individual's supervisor attempts to contact him and advise that his personal lock will be removed and that he is no longer protected. The individual should advise of any abnormal conditions that existed when he last worked on the system.
d. The individual's supervisor informs the supervisor in charge of the lock that contact was or was not made. If unable to contact the individual or if abnormal conditions existed on the system, he may decline to approve the lock removal or require assurance that the abnormal condition has been resolved.
e. After the individual's supervisor has approved the lock removal, the individual's manager must be contacted for approval.
f. If the individual was not contacted, his manager or supervisor must assure he is informed of the lock removal before he returns to work at the facility.
g. After the verbal approvals have been obtained (individual's supervisor, individual's manager), the Supervisor Lock Removal Form workflow should then be initiated by the supervisor of the lock to document the communication and approvals.
h. When the supervisor of the lock receives the workflow form, he signs, then prints a copy before submitting the form for the individual's signature when he returns to work. The copy should be filed with the hardcopy of the clearance.
i. After the three approvals (individual's supervisor, individual's manager and supervisor of the lock) have been verbally obtained, the lock and tag may now be removed using the master key. If the master key is not available, the lock may be cut off.
j. The individual must return his personal key as soon as possible after returning to work and must sign the Supervisor Lock Removal Form.
k. The completed form is automatically saved in the Electrical Safety Program folder here.

11.3 Procedure for Contractor's Lock Removal

Refer to section 13 Operations with Non-CAP Forces.

The process for removing a contractor employee's personal lock should begin prior to releasing or transferring the Special Work Permit. The process is similar where the employee's supervisor is the Contractor's Representative and the manager approval will be by the CAP Project Manager.

a. The Contractor's Representative determines that his employee is unavailable. He should contact the employee if possible, to inform him of the lock removal and to have the key returned.
b. The Contractor's Representative informs the Job Supervisor and the supervisor of the lock that his employee is unavailable and will need to have the supervisor remove the lock.
c. The Supervisor Lock Removal form should be printed and manually filled out with the employee's name and the Contractor's Representative as the employee's supervisor.
d. The form is faxed or scanned and emailed to obtain the CAP Project Manager's signature where the employee manager signs. The signed form is returned to the supervisor of the lock and filed with the clearance and Special Work Permit. The lock may then be removed.
e. If the contractor's employee returns to the facility, he must be informed of the lock removal (if not previously contacted), return the key and sign the form.
f. The completed form is sent to the Electrical Safety Program Administrator to be filed in Content Server here.

12 INTERCONNECTED SYSTEM CLEARANCES

12.1 Application

Interconnected system clearances (ICC) provide for the protection of personnel at points of interconnection between CAP and non-CAP facilities. An Interconnected System Clearance is a statement with documentation from one Operations Supervisor to another that switching has been performed on one system as a partial or complete requirement for a clearance on another system. The Operations Supervisor function at CAP is performed by the Water Control Supervisor or his designee (Water Control Dispatcher). The Operations Supervisor function for a non-CAP system is typically a power dispatcher.

12.2 Issue an Interconnected System Clearance (ICC)

A non-CAP system requires protection on the CAP system (Interconnected System Clearance).

a. The non-CAP Operations Supervisor will request the appropriate required protection on the CAP system. That request is in the form of an email to the Water Control Supervisor with a copy to Electrical Safety Program Administration.
b. Water Control Supervisor negotiates the schedule for the requested outage.
c. Electrical Safety Program Administrator prepares a CAP clearance procedure and an ICC procedure for the requested protection. The draft CAP clearance procedure is reviewed by requestor, either by phone or emailed procedure, depending on complexity.
d. Area Supervisor is informed of clearance request and also reviews draft procedure.
e. The clearance is sent to the Area Supervisor to be placed and issued to his designee. This follows the same clearance placement process.
f. Water Control Supervisor uses three-part communication to state clearly to the non-CAP Operations Supervisor exactly what protection has been provided. The non-CAP Operations Supervisor must restate the exact protection provided and state that he is satisfied the protection meets the requirements. The Water Control Supervisor must confirm the protection provided. If the restatement is incorrect, the process will be repeated until the protection provided is correctly understood.
g. Water Control Supervisor Issues the ICC to the non-CAP Operations Supervisor.
h. The ICC issuance is logged in CLEAT.

12.3 Receive Interconnected System Clearance (EICC)

CAP requires protection on a non-CAP system (External Interconnected System Clearance).

a. The standard clearance request process is followed where protection is required on a non-CAP system.
b. The Electrical Safety Program Administrator will request the appropriate protection on the non-CAP system. The request is by email to the non-CAP outage coordinator.
c. Non-CAP outage coordinator emails draft procedure for our approval.
d. Following our approval, non-CAP outage coordinator informs non-CAP Operations Supervisor of outage request. Outage is scheduled.

e. ESP Administrator saves non-CAP switching procedure as an External Interconnected System Clearance (EICC) in Content Server. A new EICC is logged into CLEAT that links to the non-CAP switching procedure.
f. ESP Administrator drafts an associated CAP clearance that includes the step "Verify EICC-YEAR-SEQ# issued to CAP". This clearance number is noted in the EICC log under "Aliases, if any".
g. On the scheduled day, the non-CAP Operations Supervisor uses three-part communication to state clearly to the Water Control Supervisor exactly what protection has been provided. The Water Control Supervisor must confirm the protection provided. If the restatement is incorrect, the process will be repeated until the protection provided is correctly understood. The Water Control Supervisor then receives the EICC from the non-CAP Operations Supervisor.
h. Water Control Supervisor logs the received EICC in CLEAT.
i. CAP Job Supervisor places the CAP clearance associated with the EICC.

12.4 Release of Interconnected System Clearance

The release of the Interconnected System Clearance will be initiated by the appropriate Operations Supervisor.

For an ICC:

a. The non-CAP Job Supervisor determines work is complete and all workers are in the clear.
b. He contacts the non-CAP Operations Supervisor to release the ICC.
c. The non-CAP Operations Supervisor using three part communication states which ICC he is releasing. CAP Water Control Supervisor confirms the ICC is being released. If the restatement is incorrect, the process will be repeated until the ICC release is correctly understood.
d. Water Control Supervisor logs the ICC release in CLEAT, then calls the Job Supervisor to release the associated clearance. Water Control Supervisor logs the associated clearance release in CLEAT.
e. Job Supervisor removes the clearance and restores the system. He logs the release in the plant log books.

For an EICC:

f. The CAP Job Supervisor determines work is complete and all workers are in the clear.
g. He contacts Water Control Dispatcher to release the CAP clearance and documents this on the clearance form. Dispatcher logs release in CLEAT, Job Supervisor removes the clearance and logs the release in the plant log books.
h. Job Supervisor advises Water Control Supervisor that switching is complete and the EICC can be released.
i. Water Control Supervisor contacts non-CAP Operations Supervisor to initiate EICC release. Using three part communication, he states which non-CAP ICC he is releasing. The non-CAP Operations Supervisor confirms the non-CAP ICC to be released. If the restatement is incorrect, the process will be repeated until the ICC release is correctly understood.
j. Water Control Supervisor logs the EICC release in CLEAT.

12.5 Interconnected System General Switching and Hot Line Orders

General Switching Request for Mark Wilmer:

a. Mark Wilmer requires the 230 kV feed from Parker Dam (PAD-HAV line) be de-energized in order to perform switching on the high voltage distribution system in the plant or in the switchyard.
b. ESP Administrator emails a general switching request to WAPA to de-energize the PAD-HAV line for approximately 2 hours. The request must be made 4 weeks in advance for a scheduled event.
c. Prior to de-energizing the line at the scheduled time, WAPA confirms with Water Control that they may proceed with switching.
d. After plant switching is completed, the plant Job Supervisor contacts Water Control advising that switching is complete and the line may be re-energized.
e. Water Control Dispatcher contacts WAPA to have the line re-energized.

External Hot Line Order:

f. Non-CAP system requires assurance that any possible backfeed is disabled. Can be formal request (email) or phone call.
g. ESP Administrator prepares clearance form in CLEAT to disable and tag only automatic switching of station service feed or generator.
h. Job Supervisor places clearance on scheduled day.
i. Non-CAP system Operations Supervisor contacts Water Control to receive no backfeed assurance. No ICC is issued because nothing was de-energized.
j. In the event of a line trip, if station service was placed in manual or local mode and tagged, plant personnel will need to manually switch by first opening the normal feed breaker, the generator is running and then manually closing the generator feed breaker. Assurance of no backfeed is still accomplished because the normal feed breaker is assured to be open.
k. Twin Peaks and Sandario cannot be manually switched, so station service can only be restored if the Hot Line Order is released or the transmission line is re-energized.
l. Non-CAP system Operations Supervisor informs CAP Water Control that hot line order is released.
m. Water Control advises Job Supervisor that hot line order is complete and clearance can be released. Water Control logs release in CLEAT.
n. Job Supervisor removes clearance and re-enables system. Release is entered on the document and in plant log books.

12.6 Interconnected Systems with CAP LO/TO

CAP requires protection on a non-CAP system that does not have a formal lockout/tagout program. Water Control coordinates with the non-CAP system Operations Supervisor for access. The clearance switching instructions include the non-CAP system hazardous energy isolating devices. CAP switchman applies lockout/tagout on the non-CAP system hazardous energy isolating devices.

13 OPERATIONS ASSOCIATED WITH NON-CAP FORCES

13.1 Application

This chapter defines procedures used for non-CAP forces performing work in CAP facilities. Examples of non-CAP forces are contractors, vendors, non-CAP interconnected system personnel, Bureau of Reclamation personnel and other government agencies having responsibilities related to CAP. For the purposes of this

chapter, the term “contractor” applies to all non-CAP forces. Work is defined as construction, maintenance or testing on or near CAP equipment.

13.2 Special Work Permit

Where the work performed by a contractor requires a lockout/tagout procedure to be established, a Special Work Permit is required to authorize the contractor to proceed with the work.

A Special Work Permit is a statement that the contractor and the CAP Representative have discussed the work to be done, reviewed the protection provided for adequacy, and defined the perimeter and conditions of the safe working area.

In certain cases (e.g. elevator maintenance), the CAP Representative may make the contractor responsible for placing his own simple lockout/tagout procedure, which shall be documented on the Special Work Permit. Any complex LO/TO must be placed by CAP personnel.

If multiple LO/TO procedures are needed for the work, they can be documented on a single permit. In other cases, multiple permits, each with one LO/TO procedure listed, may be used. The difference is that if the work requires a staged removal of LO/TO procedures, multiple permits must be used (control power locked out on an SECP may need to be restored for functional testing before the work is completed). If the work will be completed without needing to stage LO/TO removal (all removed at once), a single permit listing multiple LO/TO may be used.

13.2.1 Issuing a Special Work Permit

a. The CAP employee managing the contractor contacts the Area Supervisor and advises that a contractor is scheduled to work in his facility. If support is required from the area crew, he will create a work order. The information provided on the work order will include the equipment to be worked on, scope of work, work schedule and expected duration.
b. The Area Supervisor designates the Job Supervisor for the requested outage. They determine the appropriate LO/TO procedure needed for the work.
c. An outage request may be required if the work affects available capacity. Follow the process for placing the appropriate LO/TO procedure on the agreed upon schedule.
d. The designated CAP Representative prepares the Special Work Permit form. If multiple LO/TO procedures are placed, all must be documented on a single or separate Special Work Permits as explained above. The CAP Representative monitors the contractor’s work and signs Special Work Permits.
e. Prior to the start of work, the Job Supervisor, CAP Representative and Contractor’s Representative meet to review the job hazard analysis and the LO/TO procedure(s) in place.
f. After assuring the Contractor’s Representative understands the worksite conditions, the protection provided, and agrees to its adequacy, the Job Supervisor, CAP Representative and the Contractor’s Representative sign the Special Work Permit. This is entered into the plant log books as being “issued”. If the LO/TO procedure is a clearance, Water Control enters the SWP issuance into CLEAT.

g. The Contractor's Representative and his crew then places personal blue locks and two-part tags (furnished by CAP) on the red lock box.

13.2.2 Dive Operations Procedure

When the work involves dive operations, the Special Work Permit is created and administered by Water Control. These Special Work Permits are managed in CLEAT. The LO/TO procedure(s) required are placed and issued to the area Job Supervisor. The Special Work Permit is signed by all parties and issued at the site. The inspector (CAP Representative) contacts Water Control when divers enter and exit the water. Water Control logs these times.

13.2.3 Transferring an SWP for a Change in Protection Perimeter

A Special Work Permit can be transferred to a new clearance procedure when a change is made to the protection perimeter. This only applies to situations where the worksite must remain isolated from hazardous energy but the protection perimeter is changed. For this situation only, the transfer can be accomplished without releasing the SWP.

a. The Job Supervisor and CAP Representative review the change in perimeter with the Contractor's Representative and assure he is satisfied with the adequacy of the protection.
b. The new clearance procedure is placed and issued in accordance with the defined procedures in chapter 10.
c. The CAP Representative or Job Supervisor documents the new clearance procedure on the SWP form.
d. The Job Supervisor documents SWP transfer on the original clearance form.
e. The Contractor's Representative acknowledges the transfer by signing the form.
f. The Job Supervisor adds the SWP to the new clearance form. Water Control documents the transfer and addition in CLEAT.
g. The Contractor's Representative and his crew transfer their personal locks with new tags to the new lock box.

13.2.4 Releasing a Special Work Permit

a. When the progress of work has reached a point where there is no longer a need for a LO/TO procedure to provide protection for the contractor's workers, the SWP may be released.
b. Contractor employees remove their blue locks and tags.
c. Contractor's Representative advises the CAP Representative that he wants to release the SWP and the protection can be removed.
d. Contractor's Representative, CAP Representative and the Job Supervisor sign the release section of the SWP.
e. The SWP release is entered into the plant log books.
f. Job Supervisor releases and removes the LO/TO procedure.

13.2.5 Transfer of Contractor Representative

If the Contractor Representative on the SWP is replaced by another, this should be documented using the following procedure:

a. The new Contractor Representative name is recorded in the SWP Issued To box on the LO/TO form along with the time and date. The same SWP number is used.

b. The original Contractor Representative name is recorded in the SWP Released/Transferred box along with the time and date, on the LO/TO form. Check the Transferred Box.
c. The transfer date and new Contractor Representative is recorded on the Special Work Permit form.

13.3 Contractor Work not Requiring a LO/TO Procedure

For work not requiring protection from hazardous energy, a Special Work Permit is not needed. A job hazard analysis and pre-job brief is required. Construction contractors are required to have their own safety program which is reviewed through the Purchasing, Safety and Project Management departments.

For activities not associated with work, such as pre-bid inspections or tours, a safety briefing should be conducted by the CAP employee escort prior to conducting the tour.

14 OUTAGE REQUESTS

14.1 Purpose

Water Control approval is required for planned outages on systems that impact capacity. An outage request is a workflow process initiated by the planner to obtain that approval. Every planned clearance requires an outage request, with the exception of Headquarters and breakdowns, but not every outage request will require a clearance. Although the outage request process is not managed as part of the Hazardous Energy Control Program, it is documented here because of its close association with clearances.

14.2 Procedure

a. As part of the work order planning process, the planner must initiate an outage request to obtain approval from Water Control before scheduling work requiring an outage.
b. When the request is initiated, an email is automatically sent to the Electrical Safety Program Administrators and Water Control that an outage has been requested.
c. The request is routed for approvals (based on who was marked as an approver), ending with approval by Water Control.
d. The approved request is automatically saved to the outage approvals folder in Content Server and a notice is emailed to the Electrical Safety Program Administrators.
e. The Electrical Safety Program Administrators develop the clearance switching procedure based on the information in the approved outage form and in consultation with the Area Supervisor.
f. The final approved clearance switching procedure is filed in Content Server and linked into the Clearance Log Entry and Tracking (CLEAT) system.

15 CLEARANCE LOG ENTRY AND TRACKING (CLEAT)

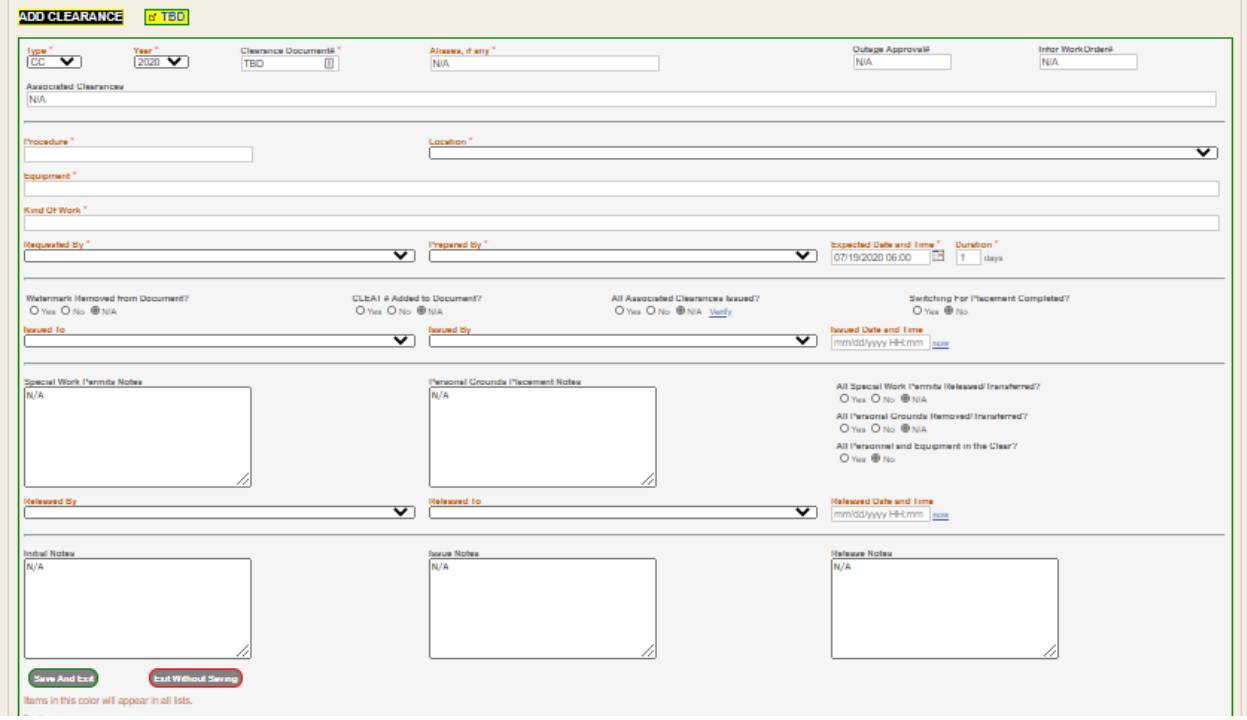
15.1 Purpose

CLEAT is a web-based clearance log and document management system that facilitates the process of requesting, approving, issuing and releasing clearances. Because it is web-based, clearance information such as status, schedule, switching forms and

planned job supervisor is available from any CAPnet computer through the Maintenance Management Dashboard (MMD).

15.2 Log Entries

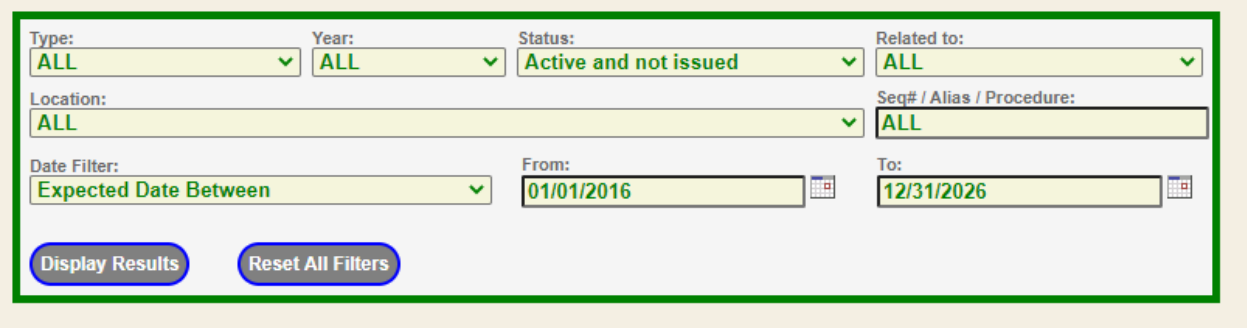
Clearance information is logged in CLEAT by the Electrical Safety Program Administrators and Water Control Dispatchers. The data entry screen is shown below and is accessible only to those employees. All required information must be entered to save the document. Information must be correctly entered regarding Special Work Permits and Personal Protective Grounds in order to release a clearance. The clearance form saved in Content Server is linked to CLEAT by entering the document number in the "Clearance Document #" field. Clearances are associated with ICC's by entering the ICC number in the "Aliases, if any" field. Typically the Electrical Safety Program Administrators fill in the top section and the Water Control Dispatchers fill in the Issued and Released sections.



15.3 Using CLEAT

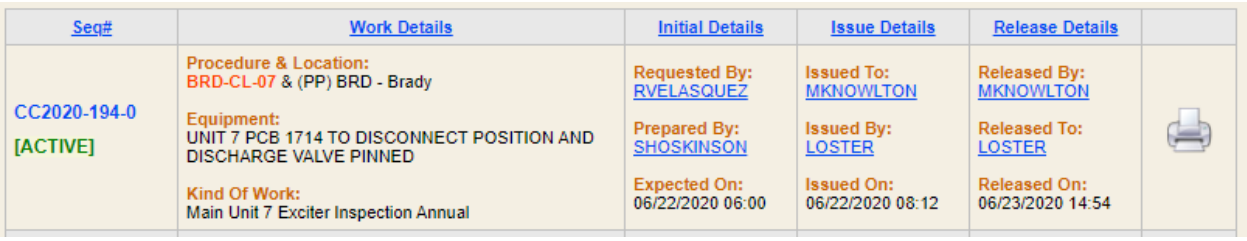
15.3.1 Filter Box

Use the Filter box to specify what clearances you want to view. Pull-down menus are provided for most fields to facilitate selections. Click on Display Results to apply the selected filters



15.3.2 Printing Clearances

Click on the printer icon on the far right of the desired clearance. Select the printer in the dialog that pops up. Select a pdf converter if you only intend to view the document. The pdf file will have to be saved on your computer.



Seq#	Work Details	Initial Details	Issue Details	Release Details	
CC2020-194-0 [ACTIVE]	Procedure & Location: BRD-CL-07 & (PP) BRD - Brady Equipment: UNIT 7 PCB 1714 TO DISCONNECT POSITION AND DISCHARGE VALVE PINNED Kind Of Work: Main Unit 7 Exciter Inspection Annual	Requested By: RVELASQUEZ Prepared By: SHOSKINSON Expected On: 06/22/2020 06:00	Issued To: MKNOWLTON Issued By: LOSTER Issued On: 06/22/2020 08:12	Released By: MKNOWLTON Released To: LOSTER Released On: 06/23/2020 14:54	

15.3.3 View Managed Lists

There are three managed lists that can be viewed.

a. **User Access Control** lists personnel that have functional responsibilities in the HECP.
   A – Administrator
   C – Control Center
   P – Preparer
   R – Requestor
   T- Control Center Trainee
b. **ICC Agencies** lists the acronyms for interconnected systems.
c. **Switchmen and Job Supervisors** lists Authorized personnel who may hold clearances, perform switching, perform high-voltage switching and place personal protective grounds for the locations and systems listed. Maintenance supervisors wishing to add or remove their employees from this managed list must inform an Electrical Safety Program Administrator and specify which list(s) to change.

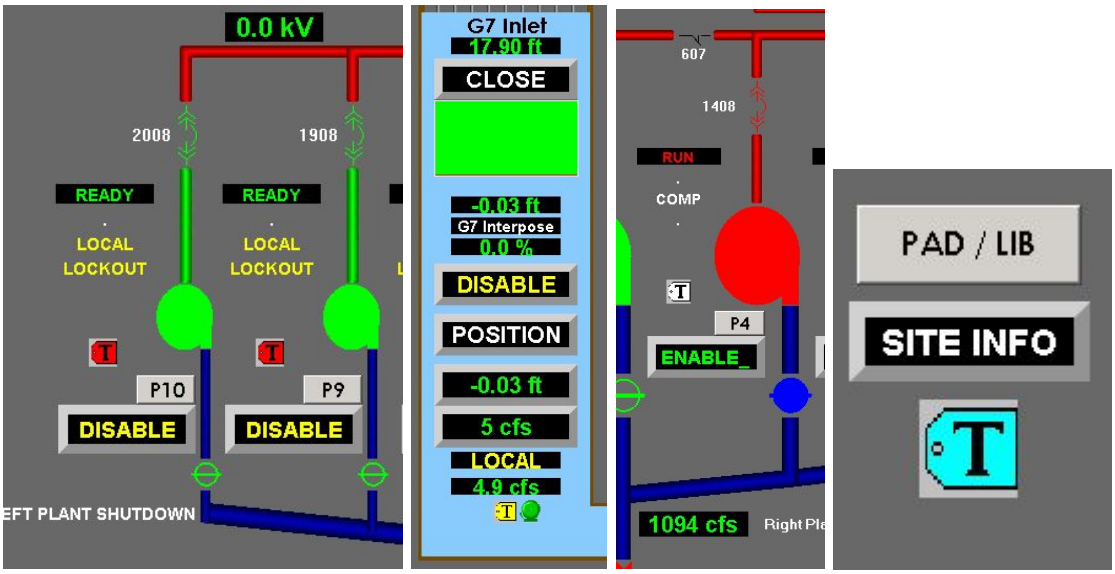
15.3.4 Outage Requests

This button links to the folders in Content Server where approved outage requests are filed. The requests are sorted by year. The list in each year folder may be filtered using the location code for the outage. Requests not filed in a year folder are pending action by the Electrical Safety Program Administrators.

16 SCADA TAGGING OF SUPERVISORY CONTROLLED EQUIPMENT

16.1 Supervisory Control Display

When a clearance, out of service or special condition is issued on equipment that is operated by a supervisory control system, the status of such equipment shall be indicated by means of an appropriate symbol on all displays that serve as supervisory control points. Examples of tagged displays are shown below:



Water Control Dispatchers apply and remove SCADA tags. The SCADA tags are necessary information for the dispatchers to operate the aqueduct system, so they must be informed when HECP tags are applied to supervisory controlled equipment. Examples of supervisory controlled equipment are: check gates, pumping units, turnout gates, recharge basin valves and trash rakes.

16.2 SCADA Tags

There are four types of SCADA tags. Each type is colored to match the HECP tag (with the exception of the information tag). Information associated with the tag is entered in a separate dialog box.

Red Clearance Tags: Clearance Number, Issued to and the Description of the work is recorded. The display screen indication and the SCADA tag **SHALL NOT BE RELIED UPON TO PROTECT** Workers.

Yellow Out of Service Tags: Tag number, Placed by and Description is recorded.

White Special Condition Tags: Tag number, Placed by and Description is recorded.

Cyan Information Tags: Information needed by the operator is recorded. There is no associated HECP tag for this.

17 OUT OF SERVICE CONDITION

17.1 Application

Out of Service locks and tags are used to alert personnel that a system or piece of equipment is not in service and should not be operated. An Out of Service condition is used to protect equipment only, and must not be used to protect workers. An example of an out of service condition might be a compressor with a failed PRV and is out of service until it can be replaced. An Out of Service condition is intended to be a temporary condition until equipment is repaired and restored to service or removed. Although there is no specified duration for an Out of Service, the condition should be evaluated periodically and resolved in a reasonable timeframe. For situations where the equipment will remain out of service for the forseeable future, it should be rendered inoperable in addition to placing the Out of Service lock and tag.

17.2 Procedure

When it is determined that equipment should be taken out of service, the procedure is:

a. The Area Supervisor determines the appropriate energy isolating device or control device to be operated.
b. The appropriate personnel perform the isolation and apply a gold lock (if possible) and tag.
c. If the equipment is supervisory controlled, the Water Control Dispatcher is informed of the Out of Service condition so a SCADA tag can be applied. For equipment that is rendered inoperable, the SCADA tag will remain in place.
d. Placement of the Out of Service condition is logged in the plant record log book or the station operating log book.
e. No work that has hazardous energy exposure may be done on Out of Service equipment. A LO/TO procedure must be placed for that work.
f. After the equipment has been restored to service or removed, removal of the Out of Service is logged in the plant record log book or the station operating log book.

18 SPECIAL CONDITIONS

18.1 Application

The Special Condition is used to provide temporary special operating or limiting instructions for equipment in service. A Special Condition protects equipment only, it must never be used to protect personnel. An example of a Special Condition might be that the auxiliary hoist on the overhead crane should not be used, only the main hoist. A Special Condition tag shall not be used for permanent instructions. If the Special Condition will persist for an extended period, the condition for which it is providing temporary special operating or limiting instructions must be reviewed annually. Following the review, if the condition is to continue without permanent instructions, the tag must be replaced. The replacement Special Condition tag must be updated to reflect current date, equipment, operating conditions, instructions, and include in the remarks the date the original Special Condition tag was placed.

Any employee who observes equipment that is in a condition that may limit its operation shall report such condition to the Area Supervisor as soon as practical. The Area Supervisor shall determine if the special condition procedure is applicable and provide any necessary instructions.

18.2 Procedure

The Special Condition tag should provide the necessary operating instructions or limitations and be attached to the equipment control device or in a position that will be immediately obvious to anyone operating the equipment. Placement of all Special Conditions shall be logged in the plant record log book or the station operating log book. If the equipment is supervisory controlled, Water Control must be informed of the Special Condition.

When the Special Condition no longer exists, the removal of the Special Condition tag shall be entered in the plant record log book or the station operating log book. Advise Water Control of the removal if the equipment is supervisory controlled.

19 DEFINITIONS

Affected Employee - An employee who works under hazardous energy controls in order to perform servicing or maintenance on machinery or equipment. Also, an employee who works in or enters areas where the hazardous energy must be controlled to perform work safely. The employee must be trained in the Hazardous Energy Control Program prior to working under a lockout/tagout procedure.

Area Supervisor – A maintenance supervisor who is the asset owner of the equipment and systems in his area of responsibility. He authorizes personnel as Switchmen, Job Supervisors and High Voltage Switchmen for his facilities based on an annual employee evaluation. He assigns the Job Supervisor on LO/TO procedures, manages the Supervisor Lock Removal process and coordinates with Water Control on emergency switching.

Authorized Employee - A person who has completed the required hazardous energy control training and is authorized to lockout or tagout a specific machine or equipment to perform service or maintenance. A person must have knowledge of the equipment and systems within his/her area of responsibility and be approved by their supervisor and the Area Supervisor as an Authorized Employee in order to apply a lock or tag to control hazardous energy.

CAP Representative - A person who is designated at the facility to monitor contractor work and prepare and sign Special Work Permits. The person must be capable of determining the correct lockout/tagout procedures to be used for the work to be performed, monitoring the work and ascertaining the work has been completed.

Clearance - A statement with signed documentation from the Water Control Supervisor or his designee, to the Job Supervisor declaring that the equipment or system to be worked on has been isolated from each source of hazardous energy, as requested.

CLEAT – Clearance Log Entry and Tracking. See Section 15.

Complex Lockout/Tagout Procedure – A lockout/tagout procedure where there are multiple sources of hazardous energy and multiple energy isolating devices and/or multiple employers. Requires a written plan of execution that identifies the person in charge (Job Supervisor). Our program has two types of complex LO/TO procedures: Specific Energy Control and Clearances.

Contractor's Workplace Representative - As used in Special Work Permits, the Contractor's

Workplace Representative assesses the adequacy of the protection provided, certifies his work has been completed, that all shorts, jumpers and personal protective grounds are removed or accounted for and all contractor personnel and equipment are clear of the work area covered by the Special Work Permit before he releases it.

Control Center - A CAP facility that houses Water Control Dispatchers from which the aqueduct is remotely controlled. A location from which load scheduling and/or system switching functions are directed.

De-energized - Electrical – Free from any electrical connection to a source of voltage and from electric charge; not having a potential different from that of the earth.
All other forms of energy – Disconnected from all energy sources and not containing residual or stored energy.

Electrical Safety Program Administrator – The persons who have been designated to manage the Hazardous Energy Control Program. Specific duties are listed in Section 2.

Emergency – A situation in which facilities are in a condition as to be a hazard to the public, CAP personnel, or the CAP power or water system equipment.

Energized – Electrical - Electrically connected to a source of voltage, or is a source of voltage.
All other forms of energy - Connected to an energy source or containing residual or stored energy.

Energy Isolation Device – A physical device that prevents the transmission or release of energy. Includes, but is not limited to, manually operated circuit breakers, disconnect switches, slide gates, line valves, blocks, or similar devices capable of blocking or isolating energy. The term does not include push buttons, selector switches, or other control devices.

Energy Source – Any supply of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, nuclear, stored, or other energy.

Equipment (or System) – Any machine, device, or apparatus, either electrical or mechanical, used in relation to electric power and waterway control. This includes electrical circuits, transmission lines, piping, transmission, spillways, irrigation outlets, conservation facilities, pump stations, etc.

Exclusive Control - Continuously being in a position to prevent (exclude) other individuals from re-energizing the machine or equipment during a servicing or maintenance activity; for example, placement of a lock by an employee provides that employee exclusive control until the lock is removed.

General Switching – Switching performed for line sectionalizing or system configuration changes for testing, changes in operating conditions or preparation for clearances. Does not require application of locks or tags, but usually requires an outage request.

Hazard Assessment - An assessment of the workplace and work activities to identify if hazards are present or are likely to be present. If there is potential exposure to any chemical, physical, or biological agent which may have a detrimental effect a health hazard assessment may be required.

Hazardous Energy – Any energy source that may cause injury or death. Any energy, including mechanical (e.g., power transmission apparatus, counterbalances, springs, pressure, gravity), pneumatic, hydraulic, electrical, water, chemical, nuclear, and thermal energy that could cause injury to employees. Hazard is only present when energy may be released in quantities or at rates that could injure employees. Hazardous chemical energy, for the purposes of this standard, includes flammable and combustible liquids, flammable gases, acids, and alkaline chemicals that may thermally produce burn injury through high or low temperature, or are sufficient enough to displace oxygen and incapacitate employees.

Hazardous Energy Control Procedures – Procedures for the control of all hazardous energy, which are to be uniquely numbered and used only one time. Each procedure must be approved before being used. Previously prepared procedures may be used for reference only (templates). Procedures for the control of hazardous energy must include:

1) The intended use of the procedure;
2) Individual responsibilities;
3) Specific procedural steps for shutting down, isolating, blocking, and securing equipment (or systems) to control hazardous energy;
4) Specific procedural steps for the placement and removal of locks (tags); and
5) The requirements for testing the effectiveness of the energy control measures.

Hazardous Energy Control Program (HECP) – The mandatory written program establishing coordinated and consistent procedures and operating criteria for the safe and reliable operation and maintenance of CAP facilities. The program establishes procedures for the control of hazardous energy for the safety of personnel.

High Voltage Switchman – An Authorized Employee designated by his Area Supervisor, based on his knowledge of the equipment and procedures in his area of responsibility, to perform switching on electrical systems rated 600 volts or greater.

Hot Line Order – A statement with documentation from a Non-CAP Operations Supervisor to a Job Supervisor that the automatic reclosing is turned off and that the equipment covered by the hot line order will not be intentionally re-energized until contact has been made with the Job Supervisor holding the hot line order. For our purposes, we provide assurance to the Non-CAP Operations Supervisor issuing the HLO that we have disabled automatic switching in the event of a transmission line trip to prevent a backfeed onto the line.

Incidental Employee – An employee who does not require hazardous energy controls to be placed to perform his duties and is not authorized to work under a lockout/tagout procedure. Incidental employees receive HEC program awareness training.

Interconnected System: A group of lines and associated equipment for the movement or transfer of electric energy between points of supply and points at which electric energy is transformed for delivery to customers or is delivered to other electric systems.

Interconnected System Clearance – A statement with documentation from one Operations Supervisor to another that switching has been performed on one system as a partial or complete requirement for a clearance on another system.

Isolation – An activity that physically prevents the transmission or release of energy.

Job Briefing (Pre-Job Brief) - A discussion conducted by the Job Supervisor with the Affected

Employees, involved in the work to be performed, before they start each job, or when the scope of work changes. The job briefing must cover at least the following subjects: hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements normally found within the context of the Job Hazard Analysis.

Job Hazard Analysis (JHA): Written identification of potential hazards present or likely to be present in a workplace and their associated mitigation techniques. The responsible supervisor, consulting with a safety or health professional if needed, assesses the workplace and work activities and determines the mitigation techniques.
Note: As work is performed under a JHA, reassess the JHA to ensure that hazards have been addressed and adequate hazards controls have been implemented. Job site monitoring and observation of work activities must be a basis for assessment and revision. Where controls are determined to be insufficient, halt work until adequate controls can be developed.

Job Supervisor – An employee authorized to request, receive, and release clearances and specific energy control procedures. He may act as the CAP Representative for special work permits. Job Supervisors must have the knowledge and skills necessary for the safe application, use, and removal of lockout/tagout procedures. A Job Supervisor is charged with the responsibility for the overall safe conduct of the work and the protection of the equipment within the lockout/tagout procedure. This term designates an HECP function. A Job Supervisor is not associated with the management or supervision of personnel.

Lockout – The placement of HECP locks on an energy isolation device in accordance with an established procedure, indicating that the energy isolation device must not be operated.

Lockout Device – A lockable device used to hold an energy-isolating device in the safe position.

LO/TO – An acronym for Lockout/Tagout.

Non-CAP – A contractor or any non-CAP utility, power system, station, or employee.

Operating Log - Documented records created, maintained, and used to describe and record operating information and events (troubleshooting, repairs, etc.) that aid in evaluating present and past unit, plant or station status.

Operations Supervisor – A person who approves, issues, receives and releases Interconnected System Clearances and external system hot line orders. At CAP, the Operations Supervisor function is performed by the Water Control Supervisor or his designee (Water Control Dispatcher). The Operations Supervisor function for a non-CAP system is typically a power dispatcher.

Out of Service – A Hazardous Energy Control Procedure used to alert personnel that a system or piece of equipment is not in service and should not be operated. See Section 17.

Outage Request – An outage request is a workflow process initiated by the planner to obtain approval for planned outages on systems that impact capacity. The request form includes details of the work sufficient to determine the protection needed.

Plant Record Log - The Plant Record Log is used to record Hazardous Energy Control

Program procedures in sequence so as to maintain the sequence numbering scheme for each type. This log provides a summary of the activity at the plant.

Protection Perimeter - A safe work area established by the hazardous energy controls to allow each Job Supervisor and Workers to maintain exclusive control over all the hazardous energy isolation devices for the scope of work to be performed.
Note: Equipment that remains energized, or that can be energized, is not a part of the protection perimeter.

Special Condition – An unusual or temporary condition pertaining to equipment (or system). See Section 18.

Special Condition Tag – These tags are used to provide temporary special operating conditions or limiting instructions affecting in service equipment.

Special Work Permit – A statement that documents the coordination between CAP and a contractor to authorize work when a lockout/tagout procedure is required. See Paragraph 13.2.

Specific Energy Control Procedure – A complex lockout/tagout procedure that specifies the steps required to isolate a specific system or piece of equipment from sources of hazardous energy and/or release hazardous stored energy. The procedure must be reviewed and approved by the employees working under it. See Section 9.

Stored Energy – Hazardous energy (electrical, mechanical, hydraulic, chemical, etc.) that remains in an isolated device such as that found in a charged capacitor, a loaded spring, chemical solutions, pressurized vessels, piping, etc.

Supervisor Lock Removal – A workflow process used when a worker is unavailable to remove his personal lock, the work is complete and the system needs to be returned to service. The process documents the actions and required approvals necessary before a personal lock is removed by means other than the worker's personal key. See Section 11.

Switching – The changing of the position of an energy control device.

Switchman – An Authorized Employee designated by the maintenance supervisor, based on his knowledge of the equipment and procedures in his area of responsibility, to perform switching for lockout/tagout or reconfiguring facility systems.

Tagout – The placement of a Hazardous Energy Control Procedure tag on an energy isolation device in accordance with an established procedure, indicating that the energy isolation device must not be operated.

Three Part Communications - An exchange of information that is clear, concise, and definitive, and ensures that the recipient repeats the information back correctly; and the transmitting party acknowledges the response as correct or repeats the original statement until any misunderstandings are resolved.

Water Control Dispatcher – A CAP employee who operates the aqueduct remotely from a control center. Issues clearances and ICC's and logs actions in CLEAT. Manages dive permits and coordinates with the inspector. Tracks system outage activity by applying SCADA tags indicating status.

Worker – An Affected Employee performing servicing or maintenance under a lockout/tagout procedure.

20 FORMS

20.1 **General Switching**

20.2 **Specific Energy Control Procedure**

20.3 **Clearance**

20.4 **Supervisor Lock Removal Form / Supervisor Lock Removal Workflow**

20.5 **Special Work Permit**

20.6 **Outage Request Workflow**

CENTRAL ARIZONA PROJECT

HAZARDOUS MATERIALS TRANSPORTATION SECURITY PLAN

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1.0 PLAN STATEMENT

CAP is committed to safety and security in the handling and transporting of hazardous materials (HAZMAT). CAP is committed to ensuring the physical safety of all HAZMAT employees and to reduce or prevent any opportunity for HAZMAT theft or misuse. In conjunction with a professional assessment, CAP has developed this Hazardous Materials Security Plan to heighten awareness of the need for strict security regarding CAP property and personnel.

2.0 PLAN OBJECTIVE

The objective of this plan is to provide for the safety of our HAZMAT employees and the security and integrity of HAZMAT products from point of origin to final destination.

3.0 SCOPE

In conformance with the U.S. Department of Transportation (DOT) regulations codified in CFR Part 172 subsection F, HM-232, CAP's written Hazardous Materials Security Plan addresses the following security:

- Personnel Security
- Unauthorized Access
- En-route Security

4.0 PERSONNEL SECURITY

4.1 SECURITY TRAINING

CAP shall strive to ensure that all HAZMAT employees are provided with thorough security training. All HAZMAT employees are trained in CAP's security plan and procedures. At a minimum, this training includes detailed instruction regarding:

- Security risks involved with HAZMAT transportation
- Methods designed to enhance transportation security
- How to recognize and respond to possible security threats

Additional in-depth security training will be provided to any HAZMAT employee that is responsible for implementing or being aware of any part of the security plan. This training includes detailed instruction regarding:

- Instruction or information on CAP's security objectives
- Specific security procedures
- Employee responsibilities
- Actions to take in the event of a security breach
- Organizational security structure

The General Manager is responsible for establishing and communicating the overall security goals of CAP.

The Managers and Supervisors are responsible for being fully knowledgeable of the security issues and concerns of their areas, departments, and employees. They are responsible for providing detailed information on system operations including daily work processes, activities and identifying potential security vulnerabilities. Once identified, managers and supervisors are responsible for the following:

- Selecting, prioritizing, developing, and implementing strategies and procedures to meet established security goals
- Measuring and monitoring the effectiveness of the security strategies and procedures
- Reviewing and, when necessary, adjusting the strategies and procedures. If deficiencies or other vulnerabilities are discovered in the security process, appropriate corrective action or adjustments will be made

Employees are responsible for following all security-related work activities, processes and procedures. Employees are encouraged to provide feedback and suggestions on ways to improve the CAP's security program.

4.1.1 SUSPICIOUS ACTIVITY

All employees are expected to understand and adhere to the following CAP Suspicious Activity Reporting Procedure. This procedure is intended for employees if they observe any unusual or suspicious activity that may pose a threat to the safety of the employees, equipment, or facilities of CAP.

4.1.2 REPORTING PROCEDURE

Employees are expected to use common sense and good judgment when assessing the threat potential of any suspicious activity. Employees will be expected to report any observed suspicious activity to Protective Services.

Suspicious activity includes, but is not limited to:

- Any person (employee or otherwise) NOT wearing a CAP approved identification badge
- Any person attempting to gain access to or information about property, equipment, facilities, or materials for no known reason
- Any person who appears to be hiding something or is acting nervous, anxious, or secretive
- Any person asking an employee to make an unauthorized movement for cash
- Any person claiming to be a representative of a utility company or the like, who cannot produce valid company identification
- Any person or group who loiters outside a CAP facility
- Any person carrying a weapon, except CAP Protective Services Agents and Law Enforcement Officers
- Any occupied vehicle driving by a CAP facility at night with the lights off, any unoccupied or abandoned vehicle parked near or outside a CAP facility

4.1.3 EMPLOYER RESPONSIBILITY

CAP will provide a work environment that is reasonably free of hazards and threats of violence, which may cause damage to property or harm. It is the policy at CAP to establish an effective and continuous safety and security program that incorporates educational and monitoring procedures. All supervisors and managers are responsible for ensuring that their employees are trained in appropriate security and suspicious activity reporting procedures.

4.1.4 EMPLOYEE RESPONSIBILITY

All employees have a responsibility to themselves and to CAP to report any suspicious or unusual activity that threatens safety or security.

4.2 EMPLOYEE/MANAGEMENT SECURITY INFORMATION SHARING

A transportation/HAZMAT security component will be discussed in appropriate employee/management meetings. Issues to be discussed include:

- New and current security measures and procedures
- General Security awareness
- An update on our security efforts and results

Managers and supervisors are responsible to communicate all relevant CAP transportation/HAZMAT security-related information, news, facts, and trends to their employees in a timely and accurate manner.

4.3 PERSONNEL SCREENING

All applicants to CAP shall submit a completed, signed and dated application for employment. Each applicant shall provide accurate previous and current employer information including, but not limited to:

- Names and addresses of previous employers
- Names and titles of previous supervisors
- Phone numbers or other contact information
- Specific written consent, signed by the applicant, as applicable under section 40-321 (b) {alcohol and controlled substance testing and verification}

The employee hiring screening process shall not be deemed complete until all previous employer information has been verified as true and accurate. Upon verification, appropriate company person will give potential employees an in-person interview. The in-person interview is used to verify any gaps in employment, reasons for job or career change, or any other important or unexplained behavior or history.

4.3.1 COMMERCIAL VEHICLE DRIVING QUALIFICATIONS AND HIRING STANDARDS

CAP's driver qualifications and hiring process shall be in compliance with all applicable state and federal regulations and meet CAP's security standards.

Applicants shall not be considered for positions requiring a Commercial Drivers License (CDL) unless they meet the following requirements:

- Meet minimum age and experience requirements
- Have a safe driving record that is equivalent to CAP's safety standards with regard to preventable motor vehicle accidents and violations of motor vehicle laws (all past driving information provided by applicants will be verified).
- Be able to speak and read English sufficiently as required by §391.11(b)(2)
- Be physically qualified to drive a CAP commercial motor vehicle

- Possess a current and valid CDL of the correct type and with the proper endorsements and not be disqualified to drive a commercial vehicle under the rules set forth in §391.15

All applicants applying for a CDL driver position with CAP shall submit an accurate, complete, signed and dated application for employment. An inquiry into the driving record during the preceding 3 years shall be made for every CDL driver applicant. The inquiry shall be made to the appropriate agency of every state in which the applicant held a motor vehicle operator's license or permit. An investigation into the employment record during the preceding 3 years shall be made for every CDL driver applicant.

CDL driver applicants shall provide accurate and complete previous and current employer information upon request, including but not limited to:

- Names and addresses of previous employers
- Names and titles of previous supervisors and dispatchers
- Phone numbers or other contact information for both of the above
- Specific written consent, signed by the applicant, as required under section 40-321(b) {alcohol and controlled substance testing and verification}

The driver qualification and hiring process shall not continue until all previous employer information for the preceding 3 years has been verified as true and correct.

An investigation into the drug and alcohol history with regard to previous employers shall be made for every driver applicant per section 40.25. The driver qualification and hiring process shall not continue until drug and alcohol information from previous employers for the preceding 2 years has been obtained and verified.

All applicants applying for the position of CDL driver shall submit to a pre-employment drug screen as required by §382.301, and no driver applicant shall perform any work or activity for CAP until a verified negative test result has been obtained for the applicant.

All applicants applying for the position of driver requiring a CDL shall be medically examined and certified as physically qualified to operate a commercial motor vehicle by a licensed medical examiner of our choosing.

4.3.2 CRIMINAL BACKGROUND INVESTIGATION

A criminal background check shall be required for all applicants applying for any position requiring a CDL with a HAZMAT endorsement. The criminal background check shall be made with regard to the provisions as set forth in 49 CFR 391.15.

4.3.3 PROOF OF CITIZENSHIP & RIGHT TO WORK

All applicants applying for any position at CAP shall be required to provide proof of their legal right to work in the United States.

5.0 UNAUTHORIZED ACCESS

5.1 EXTERNAL PARTNERSHIPS

CAP will establish a partnership and professional working relationship with local law enforcement officials, emergency responders, and other public safety and security agencies. These partnerships will include the sharing of CAP's operation, work processes, and HAZMAT stored on site or transported. CAP shall provide basic information regarding its HAZMAT operations, locations, and potential threats.

Local law enforcement officials, emergency responders, and other public safety and security agencies will be invited on-site to discuss and evaluate potential security risks, vulnerabilities, and to assist in the development or enhancement of our current security program.

All suspicious activities or apparent criminal acts affecting the safety or security of CAP's interests shall be reported immediately to the proper law enforcement agencies and appropriate CAP officials. In addition a detailed written report shall be made of any security-related incident.

A complete listing of emergency telephone numbers shall be provided to all supervisors and managers and the Control Center. This list shall include the numbers for local police and fire departments, regional state police offices, the FBI and all company managers and executives.

CAP shall request an increase in off-hours law enforcement patrols to coincide with increases in national security threat/risk levels.

5.2 INFORMATION SECURITY

All information (electronic and hard copy) relating to the storage and/or transporting of HAZMAT shall be restricted to employees on a **need to know** basis. All HAZMAT-related paperwork, and other documentation, shall be maintained and retained in a secure area with limited and controlled access.

5.3 BILL OF LADING AND MANIFEST SECURITY PROCEDURES

All Bills of Lading and Material Manifests involving the transportation of HAZMAT shall be maintained in a secure location. Access to HAZMAT loads information shall be limited to Material Control, Environmental Compliance and authorized maintenance personnel only. Material manifests must be readily accessible to local law enforcement. Material Control, Environmental Compliance and authorized maintenance personnel are responsible for the security and proper issuance of all HAZMAT load-related work assignment documents.

5.4 SECURITY INSPECTIONS

CAP is committed to providing its employees a safe and secure work environment. CAP shall provide adequate security measures to ensure the safety of our employees, equipment, facilities, HAZMAT, and the general public. The following security guidelines cover safety and security issues related to external and internal security inspection procedures.

5.4.1 External Premises Security Inspections

At facilities where perimeter fencing is in place, the Aqueduct Maintenance Department will be responsible for establishing and following a written schedule for regular inspection of the fence and associated gate(s). All necessary repairs shall be done as needed. Aqueduct Maintenance will be responsible for ensuring areas adjacent to both sides (in and out) of the fence are properly maintained and fence lines shall be kept free of debris or other objects (such as trees, pallets, or skids) that could be used to allow entry over the fence.

5.4.2 Hazardous Materials Storage Security

All HAZMAT is stored in a locked and secured area with limited and controlled access. Only authorized employees shall be allowed access to HAZMAT storage areas. Periodic inventories of all HAZMAT on site will be conducted. Any shortages or discrepancies discovered shall be investigated and/or reconciled immediately.

5.5 Visitor, Vendor and Supplier Security

All visitors to CAP are required to display a valid CAP issued ID badge while on CAP property. This badge must be worn in such a manner as to be easily visible. Visitors will be directed to park their vehicles in the designated "Visitor Parking" area. All visitors shall be required to register with the receptionist or Protective Services upon arriving. Vendors and suppliers will be directed to the receiving dock at Building 2.

5.5.1 Main Entrance Guidelines

A single point of entry shall be designated for all general visitors to the facility.

5.5.2 General Visitor Guidelines

After registering, and depending on the reason for the visit, the visitor shall:

- For Building 1 - Await the arrival of a CAP representative and be escorted to the department where visit will take place
- For Building 2 - Proceed to the appropriate department where visit will take place (only after Protective Services has contacted the host employee and receives instructions to send the guest to bldg 2)

5.5.3 EMPLOYEE AND VISITOR PARKING

Employees and visitors shall park only in areas specifically designated Employee/Visitor Parking. CAP shall be responsible to ensure parking areas are adequately lighted, safe and secure.

6.0 EN ROUTE SECURITY

While the safety of every employee is important to CAP, this section of the Hazardous Materials (HAZMAT) Security Plan addresses the procedures and guidelines specifically applicable to CDL drivers with HAZMAT endorsement ("HAZMAT Drivers") when in the process of transporting any Hazardous Materials.

6.1 POINT OF ORIGIN SECURITY PROCEDURES

At the designated loading locations, only authorized Material Control, Environmental Compliance or maintenance personnel may load HAZMAT onto CAP vehicles.

6.2 SHIPPER LOAD & COUNT

When all loading activity has been completed, HAZMAT Drivers are responsible for making sure the cargo is secure and to check the Bill of Lading or the Material Manifest to ensure cargo count is accurate. If a discrepancy is found between the cargo and Bill of Lading or Material Manifest, HAZMAT Drivers shall contact their supervisor immediately for instructions.

Once HAZMAT Drivers are satisfied that the cargo matches the shipping papers, they shall:

- File a copy of Bill of Lading or Material Manifest at loading location.
- Communicate trip plan to immediate supervisor.

Before leaving any location, HAZMAT Drivers shall make a thorough visual observation of their immediate surroundings and report any unusual or suspicious activity to their supervisor immediately.

6.3 HAZMAT STANDARD SECURITY OPERATING PROCEDURE

HAZMAT Drivers, together with their supervisor, shall prepare and execute trip plans for all HAZMAT movements that list:

- Routing schedules that avoid highly populated areas, bridges, and tunnels when possible;
- Fueling and break locations (including approximate dates and times for same);
- Dates and times of daily/routine check calls; and
- Estimated times of arrival to stops and final destination.

These trip plans shall also include potential alternate routes and acceptable deviations.

For all HAZMAT transport, HAZMAT Drivers shall minimize stops en-route. Proper execution of thorough trip plans will help reduce the need for unnecessary or unplanned stops.

In the event a load containing HAZMAT needs to be staged at a CAP facility while en-route, it shall be stored in a secured (fenced in) location with limited and controlled access.

6.4 HAZMAT Driver Security Guidelines & Procedures

While in transit, HAZMAT Drivers are prohibited from discussing information related to their load, route, or delivery schedule with any person(s) other than authorized CAP employees. HAZMAT Drivers are to report any suspicious activity (including load-related inquiries from strangers) to their supervisors immediately.

HAZMAT Drivers are expected to take all reasonable and responsible precautions to prevent damage to company vehicles and theft of HAZMAT cargo while in transit.

For personal protection and safety, and the security of the cargo, HAZMAT Drivers are expected to park in safe, well lit, designated truck-parking locations only (such as reputable major rest stops). When possible, trucks should be parked against a wall, fence, or other stationary/fixed object to enhance cargo security.

In all cases, HAZMAT Drivers are required to inspect their vehicle for evidence of tampering after each stop.

HAZMAT Drivers shall lock their vehicles and securely close all windows at all times while stopped – especially during all time spent in urban areas, and parked at truck stops and rest areas.

HAZMAT Drivers are prohibited from taking any loaded equipment home, or parking in any unsecured area. HAZMAT Drivers failing to abide by this policy are subject to disciplinary action up to and including termination of employment.

HAZMAT Drivers are expected to maintain regular communications with CAP while in transit and notify immediate supervisor when HAZMAT has been off-loaded. HAZMAT Drivers are expected to fully understand this procedure and make every effort to maintain regular contact and communication.

6.5 HAZMAT Driver Hijack or Cargo Theft Guidelines

HAZMAT Drivers are prohibited from picking up and transporting any unauthorized person. HAZMAT Drivers who fall victim to vehicle hijackers or cargo thieves are instructed to notify CAP Protective Services department and the local police as soon as possible. Once the proper authorities have been notified, drivers are required to contact their immediate supervisor and follow all subsequent instructions.

In the event of an attempted vehicle hijacking or cargo theft situation while the vehicle is in motion, HAZMAT Drivers should take a **“NO STOP”** approach. HAZMAT Drivers who believe a vehicle hijacking is, or may be, in progress are

instructed to keep the vehicle moving as safely and responsibly as possible until the attempt has ceased and/or the authorities have been notified. However, in any hijack situation, HAZMAT Drivers should use their own good judgment (whether to stop or keep moving) based on the degree to which they feel their personal safety is at risk. Nothing is worth jeopardizing their health or safety.

6.6 Destination Security Procedures

Upon arrival at the destination, HAZMAT Drivers shall check in with the responsible receiving party to notify them of arrival. Drivers shall follow proper unloading instructions and obey all plant safety and security rules and procedures. In conjunction with the Homeland Security Advisory System (HSAS), CAP may increase security based on risk conditions:

- In the event of a HIGH or ORANGE threat level, driver should take additional precautions when stopping en-route
- In the event of a SEVERE or RED threat level, CAP shall monitor or constrain HAZMAT Driver travel or locations for stopping

6.7 Qualifying Third Party Motor Carriers

In the event that CAP requires the use of a third party motor carrier for the purposes of transporting HAZMAT, each carrier shall be qualified as follows:

- The carrier's current safety rating (SafeStat score) shall be considered, including a detailed review of all relevant safety-related data as found in the carrier's detailed profile summary report, including:
  - The carrier's current safety rating
  - Recent compliance review/audit data
- The carrier must have a current security plan in place
- Carrier must submit information regarding their driver/employee hiring, screening, and review process. Carrier will be responsible for ensuring its HAZMAT Drivers remain qualified through a process of annual review, and will be asked to provide verification documentation. At a minimum, carrier must demonstrate it has in place an appropriate and thorough background investigation process for all HAZMAT Drivers, that, at a minimum, includes:
  - Previous employer inquiries
  - Driving records review

Before loading any HAZMAT, the identity of the HAZMAT Driver and motor carrier shall be verified. HAZMAT Drivers will be asked to produce photo identification and current CDL, and the carrier shall be contacted to verify the:

- HAZMAT Driver's name and license number
- Tractor/truck number
- Trailer number

CAP will verify that the motor carrier has terminal-to-truck tracking and communication capabilities.

CENTRAL ARIZONA PROJECT

HEARING CONSERVATION PROGRAM

REVISED OCTOBER 1, 2019

1.0 PURPOSE

To reduce noise hazard exposures, Central Arizona Project (CAP) is establishing a Hearing Conservation Program (HCP) to preserve workers' hearing and eliminate the adverse effects of high noise levels at CAP worksites. In addition, this HCP will help reduce Workers' Compensation claims and protect the company's assets.

2.0 SCOPE

CAP will provide all employees with a safe and healthful working environment. This is accomplished by utilizing facilities and equipment that have all feasible safeguards incorporated into their design. When effective engineering controls are not feasible, or when they are being initiated, administrative controls will be used when and where possible, followed by the use of personal protective equipment.

The primary goal of this CAP HCP is to reduce, and eventually eliminate hearing loss due to workplace noise exposures at all facilities. This program includes the following elements:

1. Work environments will be monitored to identify potentially hazardous noise levels and personnel at risk of hearing impairment.
2. Environments that contain equipment that produces potentially hazardous noise must, wherever it is technologically and economically feasible, be modified to reduce the noise level to acceptable levels.
3. Where engineering controls are not feasible, administrative controls and/or the use of hearing protective devices will be employed.
4. Annual and periodic hearing testing will be conducted to monitor the effectiveness of this HCP. Early detection of temporary threshold shifts will allow further protective actions to be taken before permanent hearing loss occurs.
5. Initial and annual refresher training on the HCP.

The Environmental, Health & Safety (EH&S) Department, aware that excessive noise exposure is a primary cause of hearing loss, is establishing a HCP that is more conservative than that required by the Occupational Safety and Health Administration (OSHA). CAP has adopted the American Conference of Governmental Industrial Hygienists (ACGIH) noise exposure limits referred to as the Threshold Limit Value® (TLV®). The current Occupational Exposure Limit at CAP is based on the most recent TLV® which is shown in table 1-1 on the following page.

Table 1-1

Duration per day	CAP's Occupational Exposure Limit	CAP's Action Level
12 hours	83 dBA	80 dBA
10 hours	84 dBA	81 dBA
8 hours	85 dBA	82 dBA
4 hours	88 dBA	85 dBA
2 hours	91 dBA	88 dBA
1 hour	94 dBA	91 dBA
0.5 hour	97 dBA	94 dBA
0.25 hour	100 dBA	97 dBA

When sound pressure levels exceed the Occupational Exposure Limit (OEL) in Table 1-1, feasible administrative or engineering controls will be instituted. If the controls fail to reduce the sound levels to within the OEL, hearing protection will be provided and used to reduce the noise to an acceptable level. CAP employees with noise exposures equal to or exceeding the Action Level in Table 1-1 will be covered by this HCP.

3.0 RESPONSIBILITIES

3.1 ENVIRONMENTAL, HEALTH & SAFETY DEPARTMENT: The EH&S Department is responsible for developing and assisting all departments in the implementation of this HCP. This function will include the following activities:

1. Assisting all departments in acquiring engineering guidance on noise control and providing a liaison, as necessary, with noise engineering, health and safety consultants, and noise consultants;
2. Providing initial and periodic training for all affected employees;
3. Coordinating noise surveys of CAP facilities to ensure adequate information is available for this HCP;
4. Assisting in the development of noise emission specifications for existing and future equipment purchases;
5. Conducting studies to determine effectiveness of hearing protection in use, noise abatement actions, and this HCP;
6. Approving hearing protective devices;
7. Scheduling and coordinating audiometric testing (pre-employment and annual as applicable);
8. Maintaining audiometric test records; and

9. Notifying employees of the results of their audiogram.

3.1.1 Occupational Medical Clinic: The occupational medical clinic contracted by CAP will be responsible for conducting audiograms for employees identified by the EH&S Department.

3.1.2 Training Activity: The EH&S Department is responsible for coordinating and scheduling health and safety training courses presented or sponsored by CAP. The Centralized Learning and Development (CLD) department maintains documentation of the training courses presented in accordance with the HCP requirements. Additionally, all training programs for hearing conservation will be prepared in accordance with this HCP and the Senior Industrial Hygienist.

3.2 Managers and Supervisors: It is the responsibility of CAP Managers and Supervisors to ensure that all noise exposed employees have access to appropriate hearing protective devices in the work area. Managers and Supervisors are responsible for enforcing the use of hearing protective devices and engineering and administrative controls in designated hazardous noise areas. In addition, Managers and/or Supervisors should request noise surveys to be completed by EH&S whenever they have reason to believe that an area may be noisy.

3.3 Engineering and Planning Departments: Future purchases of operating equipment must consider noise controls as a feature of the purchase agreement. Specifics on noise control technologies can be obtained through the EH&S department and noise consultation services.

3.4 Employees: Employees are responsible for wearing and maintaining hearing protective devices as instructed. Employees exposed to noise levels in excess of those in Table 1-1 must also participate in annual education and training programs and the medical surveillance program which includes audiometric testing.

3.5 Audiology Consultant: The Audiology Consultant is a contracted medical consultant providing audiological (hearing), otological (ear), and/or otolaryngological (ear and throat) evaluations based on the findings of the audiometric testing portions of this HCP. The consultant will be a physician who is Board Certified by the American Board of Otolaryngology.

CAP employees with noted hearing shifts will be referred to the Audiology Consultant to identify the cause of the hearing shift.

4.0 NOISE EVALUATIONS AND SURVEILLANCE PROCEDURES

4.1 **Identification of Hazardous Noise Areas**: The EH&S Senior Industrial Hygienist will identify work areas within CAP facilities where noise levels equal or exceed 80 dBA. Records will be maintained by the EH&S Department and updated as necessary to determine if any alteration in noise levels has occurred. Those areas where the noise levels are below 80 dBA will not be routinely monitored.

Signs and ear plug dispensers will be posted at the entrance to any work area where noise levels exceed 80 dBA. Personnel working in these areas will have hearing protection supplied to them, will be instructed in its proper use, and will be required to wear hearing protection.

4.2 **Noise Measurements and Exposure Assessments:** In order to effectively control noise it is necessary that the noise be accurately measured according to standard procedures and that the measurements be properly evaluated against accepted criteria.

Noise monitoring of employees is made up of two parts: area and personal monitoring. Area measurements will generally be obtained first. If noise levels are at or above 80 dBA, personal monitoring using dosimeters will then be performed.

4.3 **Re-monitoring of Noise**: All areas where noise levels equal or exceed 80 dBA will be re-monitored if there is a significant change in equipment that could impact noise levels.

Any area with noise levels that equal or exceed 84 dBA will be re-monitored whenever there is a change in production process, equipment, or controls. This re-monitoring will evaluate the effects of the changes to determine if noise levels have increased or decreased since the last monitoring. Areas where the noise levels have dropped below 80 dBA due to alterations in equipment, controls, or process changes will be eliminated from the monitoring program.

5.0 NOISE CONTROL METHODS

5.1 **Engineering and Administrative Controls**: The primary means of reducing or eliminating worker exposures to hazardous noise is through the application of engineering controls. Noise surveys conducted by the EH&S Department will identify areas where hazardous noise levels are occurring within CAP operations. Written reports on the noise survey will provide recommendations, when feasible, on various engineering controls that will reduce the noise levels. Managers and supervisors will then select the control(s) that are feasible and ensure these controls are instituted to reduce worker exposures to noise hazards.

Administrative controls are defined as changes in the work schedule or operations which reduce noise exposure. If engineering solutions cannot reduce the noise to

acceptable levels, administrative controls such as increasing the distance between the noise source and the worker or rotation of jobs between workers in the high noise area should be used.

5.2 **Personal Protective Equipment**: Hearing protective devices (ear plugs, muffs, etc.) will be the permanent solution only when engineering or administrative controls are considered to be infeasible, cost prohibitive, or do not reduce noise to less than the values listed in Table 1-1.

5.2.1 **Types of Hearing Protective Device:** Hearing protective devices include the following:

1. **Insert Type Earplugs**: A device designed to provide an air-tight seal within the ear canal. There are three types of insert earplugs: pre-molded, formable, and custom earplugs.

2. **Earmuffs:** Earmuffs are devices which surround the ear to reduce the level of noise that reaches the ear canal. Special earmuffs can be provided that attach to hardhats and other pieces of protective equipment and still maintain their effectiveness.

5.2.2 **Selection of Hearing Protective Devices:** Employees will be given the opportunity to select hearing protective devices from a variety of suitable ones provided by the EH&S Department. Combinations of ear plugs and earmuffs may be needed in certain noise environments. Employees enrolled in the HCP will undergo earplug fit testing during new employee orientation to ensure a proper fit and insertion technique.

5.2.3 **Fitting and Issuing of Hearing Protective Devices:** The key issue in an effective HCP is the fitting and issuing of Hearing Protection Devices (HPDs). The issuance of hearing protective devices is handled through the Supervisors at each work site. The EH&S Department has evaluated the noise environments at each facility and is responsible for selecting hearing protective devices (foam inserts, disposables) based on the noise type, level, and worker preference. Instruction on the proper use and care of earplugs and earmuffs will be provided whenever HPDs are dispensed.

5.2.4 **Maintenance of Hearing Protective Devices:** The effectiveness of HPDs can only be maintained if the devices are maintained in a clean, sanitary condition. Preformed PVC plastic plugs and earmuffs are designed to be washed and

reused. Keep hearing protection devices clean to maintain their ability to reduce noise.

1. Reusable earplugs, such as the triple flange devices can be washed in lukewarm water using hand soap, rinsed in clean water, and dried thoroughly before use. Cleaning should be done as needed. Replace any plugs that do not look new.
2. Earmuff cushions should be kept clean. Many earmuffs have detachable cushions on the ear cup which can be removed, cleaned in mild soapy water and returned to the muff. Use caution not to get water inside of the cup.

6.0 MEDICAL SURVEILLANCE

6.1 Medical Surveillance Monitoring: Employees whose noise exposures equal or exceed those listed in Table 1-1, based on noise surveys by the EH&S Department, will be recommended for inclusion in the Hearing Conservation Program's Medical Surveillance Monitoring.

6.2 Audiometric Testing: The Occupational Medical Clinic has the responsibility for administering the Audiometric Testing portion of CAP's Hearing Conservation Program. Annual retesting will be performed for all personal enrolled in this Medical Surveillance Monitoring Program.

6.2.1 Baseline Audiogram: The baseline audiogram must be obtained within the first 30 days of employment at CAP. Ideally, the baseline audiogram should be recorded during the first week of employment. The employee should have absolutely no noise exposures for at least 16 hours prior to testing for the baseline audiogram. Workers should avoid any loud activities that could shift their hearing prior to the audiogram.

A report on the baseline audiogram will be provided to the employee along with an explanation of the results of the test and any recommendations for hearing protection during working activities at CAP.

6.2.2 Annual Audiogram: Annual audiograms will be conducted at the beginning of the regular work shift prior to employees receiving workplace noise exposure. Employees showing a confirmed standard threshold shift, will be consulted to evaluate noise exposure patterns, on and off the job; use of HPDs; and workplace noise exposures using noise dosimetry. Efforts to reduce noise exposures will be completed.

6.2.3 Confirmation Audiogram: A confirmation audiogram is to be conducted when the annual audiogram indicates an OSHA STS, with age correction. This

confirmation audiogram must be conducted within 30 days of the posting of the annual audiogram results. The confirmation audiogram will be conducted by the occupational medical clinic and be preceded by at least 16 hours of "quiet" time before testing.

The confirmation audiogram will be reviewed at the occupational medical clinic by an Occupational Medicine physician. If the physician determines that the shift represents an OSHA Standard Threshold Shift (STS), the following actions will be completed.

1. Refer the employee to the Audiological Consultant for a clinical evaluation to determine if additional testing is needed or if medical pathology of the ear may be caused or aggravated by the wearing of HPDs;
2. Inform the employee of the need for further evaluation (at the employee's own expense) if a medical pathology is the suspected cause of the hearing shift;
3. The STS will be recorded on the OSHA 300 form if results of the Audiological Consultant indicate that the STS is the result of an occupational noise-induced Permanent Threshold Shift.
4. Reset the employee's Baseline Audiogram, based on the results of the Confirmation Audiogram.

6.2.4 Exit Audiogram: Employees enrolled in the HCP will be offered an exit audiogram upon reassignment to a non-noise hazard area or upon termination from CAP, including retirement. The exit audiogram will be scheduled by the EH&S Department prior to the last date of service to the company. The employee should have at least 16 hours of quite time prior to this exit audiogram to ensure a true measurement of any threshold shifts experienced by the employee. The exit audiogram will be at no cost to the employee regardless of the employee's employment status. An audiogram results letter will be mailed to the employee as soon as possible after receipt of the audiometric results in Cority.

6.3 Audiometric Referral: In the event that an employee's confirmation audiogram indicates an OSHA Standard Threshold Shift (STS) has occurred, the shift (illness) will be recorded on the 300 log and the employee will be referred to the Audiological Consultant. CAP's Audiological Consultant must be board certified in Otolaryngology. A letter indicating the requirements of the referral will be provided to the Consultant when the appointment is arranged by the EH&S Department whether this OSHA STS is caused or aggravated by workplace noise exposure or the wearing of hearing protection.

Upon receipt of the otolaryngologist report, the Sr. IH will review the report and forward a copy to the employee.

If the otolaryngologist states that the hearing loss (STS) is caused by exposure to workplace noise the Sr. IH will notify the EH&S Manager and the employee's name will be left on the OSHA 300 log. The baseline audiogram will be reset according to the direction of the Otolaryngology Report. Risk Management will be notified of a possible Workers' Compensation case.

If the otolaryngologist states that the STS is not caused by workplace noise the Sr. IH will notify the EH&S Manager and the employee's name will be lined out on the OSHA 300 log.

If the otolaryngologist states that he cannot make a conclusive determination without an MRI, then the following policy will guide further evaluations:

6.3.1 If the doctor indicates that the STS may be due to workplace noise *or* that he cannot make a decision as to the cause of the STS, then EH&S will make arrangements for the MRI and pay for the procedure and any follow up.

1. If the doctor's review of the MRI indicates the hearing loss was due to workplace noise, the illness will be left on the OSHA 300 log.
2. If a review of the MRI indicates a medical cause for the hearing loss, the illness will be lined out on the OSHA 300 log. The MRI and the doctor's report will be turned over to the employee for further follow up with a specialist of the employee's choice. The employee will not have to reimburse CAP for the cost of the MRI/evaluation, but will be responsible for any further evaluations or medical treatments.

6.3.2 If the doctor indicates that the STS may not be due to workplace noise then the employee will be instructed to make their own arrangements for the MRI, either through the examining otolaryngologist (preferred), or a specialist of the employee's choice

1. If a review of the MRI finds no medical indication for the hearing loss and the consulting otolaryngologist determines that the loss is due to workplace noise, then the illness will be left on the OSHA 300 log and:

    - CAP will assume responsibility for the STS as an occupational illness and reimburse the employee for any out-of-pocket medical expenses related to the MRI. EH&S will notify Risk Management of a possible Workers' Compensation case.

- The employee will assist with obtaining a copy of the otolaryngologist's MRI report from the consulting otolaryngologist or the employee's specialist for filing.

2. If a review of the MRI indicates a medical cause for the hearing loss, the illness will be lined out on the OSHA 300 log and the employee will continue to be responsible for any costs associated with the MRI and any further evaluation or treatment.

7.0 EMPLOYEE INFORMATION AND TRAINING

The information and training program will provide information about the adverse effects of noise and how to prevent noise-induced hearing loss. At a minimum, all new employee and annual refresher training will cover the following topics:

1. Recognizing hazardous noise;
2. Effects of noise-induced hearing loss;
3. Symptoms of overexposure to hazardous noise;
4. Hearing protection devices - advantages and limitations.
5. Selection, fitting, use, and maintenance of HPDs.
6. Purposes of the Medical Surveillance Monitoring and explanation of how audiograms are recorded and maintained.
7. Explanation of noise measurement procedures.
8. Hearing Conservation Program requirements.

Employees will also be given access to copies of the OSHA noise standard (29 CFR 1910.95) including location of the OSHA Internet web site and provided with other handouts describing CAP's Hearing Conservation Program.

All personal identified for inclusion in the Hearing Conservation Program should receive a minimum of one hour of initial instruction in the requirements of the program during New Employee Orientation with the EH&S Department. Annual refresher training will be provided by the EH&S Department.

8.0 PROGRAM EVALUATION

Periodic program evaluations will be conducted to ensure compliance with federal and state regulations and to review the effectiveness of CAP's Hearing Conservation Program.

9.0 RECORDKEEPING

Records of noise surveys, noise dosimetry, training, and audiometry are required to be kept for specific periods of time. Table 9-1 lists the location of the required records and the time period that CAP will maintain the records. At the expiration of the allowed time period, the records will be destroyed by secured shredding or will be archived by scanning and storage on Content Server.

Table 9-1 – CAP Recordkeeping Requirements

Record	Location	Retention Period
Medical Evaluations and Audiograms	Occupational Medical Clinic (see Attachment A) and Medgate Computer Software	Duration of the employee's employment and 30 years thereafter.
Training Records	CAP Learning Center	30 years after completion of training class.
Hearing Conservation Program Manual, SOPs, etc.	Safety & Health Department – Content Server	For 5 years after a revision or modification to the current document.
Hazard Evaluations, Noise Surveys, Dosimeter Data	Safety & Health Department – Content Server	For 30 years after completion of the field survey.
Program Evaluations and Audits	Safety & Health Department	For 5 years after completion of the evaluation or audit.
Documentation of Audiometric Calibrations and Background Noise Levels	Safety & Health Department – Content Server	For 30 years after the completion of the calibration or noise measurement.

CENTRAL ARIZONA PROJECT

ENVIRONMENTAL, HEALTH, AND SAFETY DEPARTMENT

HEAVY METALS
EXPOSURE CONTROL PROGRAM

OCTOBER 9, 2014

CENTRAL ARIZONA PROJECT
HEAVY METALS EXPOSURE CONTROL PROGRAM

Table of Contents

1.0 PURPOSE

The purpose of this document is to specify procedures for Central Arizona Project (CAP) employees which will protect them from illnesses occurring due to exposures to several heavy metals. Heavy metal containing products, stainless steel, and lead-painted surfaces are common on CAP property and equipment. As such, this program is designed to identify the hazards of these heavy metals; to provide information on how employees can be protected from metals exposure hazards; and to implement procedures to identify, evaluate, and control those occasions when exposures could occur.

2.0 POLICY

2.1 It is CAP's policy that all personnel who could encounter exposures to heavy metal containing materials be aware of the risks of such encounters and be knowledgeable of the controls available to reduce or eliminate exposures. All work activities will be in accordance with this program and in compliance with all Federal, State, and Local requirements related to exposures to these metals.

2.2 Compliance with instructions and procedures contained in this Heavy Metals Exposure Control Program is mandatory. Willful disregard for this program or any of its provisions will result in corrective action as outlined in CAP Administrative Policy.

3.0 SCOPE

Compliance with the Occupational Safety and Health Administration (OSHA) standards for heavy metals exposure does not ensure that workers are completely safe from risk. CAP's Heavy Metal Exposure Control Program is intended to meet the compliance requirements of the OSHA General Industry and Construction standards, as applicable, and to exceed those requirements when it is judged prudent and feasible to do so.

Most of the maintenance operations at CAP facilities will be designated as construction work as we repair, renovate, and maintain pumping and water delivery equipment. As such, this program is designed to follow the regulatory requirements of the OSHA standards for construction. Where construction standards do not exist for a heavy metal, the General Industry standard(s) will serve as guidance on reducing or eliminating workers risk of exposures. Exposures are evaluated base on both airborne particulate as well as settled dusts and fumes. Where biological exposure indices are available, these may also be used to evaluate worker risk. Exposures to particles, dusts, and fumes can occur during any of the four OSHA defined work practices described below.

- manual demolition, scraping, sanding, heat gun applications, power tool cleaning with filtered dust controls, or spray painting operations with metal-containing pigments;
- any metal working applications where the employer has reason to believe that employees could have exposures approaching or exceeding either the OSHA Permissible Exposure Limit or the American Conference of Governmental Industrial Hygienists Threshold Limit Values®;

- during the burning of metal-containing materials, impacts to lead-containing coatings, rivet busting, power tool cleaning without filtered dust control, cleanup of dry abrasives, or working with lead coatings in an abrasive blasting enclosure; and
- when abrasive blasting, welding, grinding, torch cutting, or torch burning on any heavy metal containing structures.

CAP's Heavy Metal Exposure Control Program is focused on controlling exposures during work practices described. Several of the work activities described above are prohibited at CAP and are listed as follows: demolition or scraping of equipment or structures containing heavy metals without prior authorization from Environmental, Health, and Safety Department (EH&S), sanding of lead containing surfaces, heat gun applications to metal containing coatings, powered tool cleaning with filtered dust controls, and spray painting with lead-based paints.

The following are work practices which could occur at CAP and fall into those exposure risks listed above:

- firing range exposures
- torch cutting painted metal structures
- solvent removal of lead-painted surfaces
- abrasive blasting of lead-painted surfaces
- repair or renovation on lead-painted surfaces
- use of welding rods or wire with heavy metals
- maintenance which disturbs lead-painted surfaces
- soldering with lead/tin solders
- welding on stainless steel metals
- cleaning of surfaces containing lead dust
- welding metals which contained lead paint
- sanding or grinding of stainless steel equipment
- disassembly of lead painted equipment/structures

3.1 *Hazards of Heavy Metal Exposures*

3.1.1 Ways in which heavy metals can enter the body.

At CAP the presence and use of heavy metals is wide-spread. They can be found as alloys in the impellers of the pumps, in electronic switches up and down the canal, as stock materials to be fabricated into equipment or components to deliver water, and as settled dusts and fumes from work operations which impact these metals. In almost all cases the metals are particulate matter, the exception being mercury which is either a liquid, in its natural state, or is released as a vapor (gas phase).

The particulate material (dusts and fumes) from heavy metals become a hazard to workers when it sticks to clothing, hands, and skin to be ingested with food or drink, or to be carried home at the end of the work day to contaminate our homes and families. When these particles are left in place they are further reduced in size by foot traffic, rolling wheels, and movement of parts, crushing them into finer dusts and re-suspending the dusts into the air.

These dusts, fumes, and vapors enter the body by inhalation as we breathe. Dusts can range in size from visible particles (generally larger than 50 to 60 micrometers (µm)) down to fumes which have particles sizes of less than 1 µm. Particles smaller than 10 µm can penetrate deep into the lungs during breathing. We can't see them because they are not visible to the naked eye and they can do the most damage when they lodge deep in the lungs where the particles

can penetrate the lung tissue or be carried by the blood to other organs such as the liver, kidneys, brain, bones, and reproductive organs.

The dusts that settle out during the working of these metals (welding, grinding, torch cutting, and machining) are a hazard as workers contact the dusts during work activities or cleanup. The dusts can remain on the skin to be later ingested when we touch our face, mouth, eyes, or food and drink. When working around these metals it is imperative that we use good personal hygiene and keep our hands clean to prevent additional exposures to the metals. When welding a piece of stainless steel the plume of smoke can contain a significant number of metals. And after the fumes settle out on a table top, the fine dusts you just put your fingers into might contain hexavalent chromium or manganese which could make you sick, damage your kidneys, or even cause cancer.

Research conducted by the National Institute for Occupational Safety and Health (NIOSH) in Tucson in the mid to late 1980s found that ultra-fine particles (less than 1 µm in size) of metals were capable of penetrating the skin to get into the body, especially at locations where there was skin-on-skin contact (under the arms, in the groin, between the fingers, etc.). This study indicates a potential third route of exposure to these metals.

3.1.2 Effects of exposure to heavy metals.

It is imperative that CAP identify the sources of these metals within our work place and take steps to control or eliminate the generation of particulate matter to prevent worker exposures. Acute (short term-high level) and chronic (long term-low level) exposures all contribute to injury and illnesses related to heavy metals. For example:

- Metal fume fever and pneumonitis are caused by acute exposures to metal fumes such as zinc, manganese, magnesium, and their oxides. Symptoms, usually fever and chills, appear from 4 to 12 hours after exposure. Persons usually recover within one to two days, but symptoms can recur with repeated exposures. Over exposures to cadmium and cadmium oxide fumes can result in fatal pulmonary edema within a day of exposures.
- Pneumoconiosis, meaning "dusty disease of the lungs", is caused by the accumulation of mineral or metallic dust particles in the lungs due to chronic exposures. This can result in decreased lung function, and an increase in the demand placed on the cardiovascular system, and eventual heart failure. The accumulations are identified as "shadows" on the lungs that can be seen in a chest x-ray. Some pneumoconiosis are benign (non-cancerous growths), while others may lead to fibrosis (scarring) of the lung, continuing to spread after exposure has ended. Some metal exposures have been shown to cause cancer (arsenic, cadmium, chromates, nickel, and lead).

- Systemic poisoning is the damage to organs (such as kidneys or liver) or organ systems (such as reproductive, urinary, circulatory, respiratory, or central nervous systems) when a toxic agent enters the body. Inhalation is the most common route of entry for metal fumes and dusts. Bone cancer, blood cancer (leukemia), kidney failure, or heart failure can result. Because the early symptoms of metal poisoning (e.g., blurred vision, headache, fatigue, delirium, diarrhea, and chest pains) are often attributed to other causes, misdiagnosis can occur.

- There is also a substantial amount of medical evidence that exposures to heavy metals create a significant risk of occupational hearing loss, even when not exposed to loud noise. Additionally, exposures to moderate noise levels AND heavy metals combined has an effect similar to exposures to high noise levels alone.

3.1.2.1 **Arsenic** exposures are known to cause headaches, confusion, severe diarrhea, and drowsiness. As the poisoning develops, convulsions and changes in fingernail pigmentation called leukonychia may occur. When the poisoning becomes acute, symptoms may include diarrhea, vomiting, blood in the urine, cramping muscles, hair loss, stomach pain, and more convulsions. The organs of the body that are usually affected by arsenic poisoning are the lungs, skin, kidneys, and liver. Arsenic exposures have also been related to heart disease, cancer, stroke, chronic lower respiratory disease, and diabetes.

3.1.2.2 **Cadmium** dust exposures are known to cause both acute and chronic effects. Short term exposures irritate the nose and throat. If enough has been inhaled, after a delay of several hours, a person may develop cough, chest pain, sweating, chills, shortness of breath, and weakness. Ingestion of cadmium dust may cause nausea, vomiting, diarrhea, and abdominal cramps. Long term exposures to cadmium may cause loss of sense of smell, ulceration of the nose, shortness of breath (emphysema), kidney damage, and mild anemia. Exposures are also associated with prostate cancer in men. Laboratory studies have found birth defects in animal offspring.

Cadmium fumes, due to the smaller particle size, are much more toxic than the dusts. Short term exposure effects are very similar to the effects of dust exposures. Long term exposure to cadmium fumes however, causes severe pulmonary swelling that can often lead to death. Chronic exposures at lower levels cause emphysema and swelling of the lung tissue leading to difficulty in breathing. Other effects include kidney damage and increased incidence of lung cancer and prostate cancer.

3.1.2.3 **Hexavalent chromium** exposure is associated with lung, nasal, and sinus cancer. Other respiratory effects include nasal irritation and ulceration, and perforation of the

nasal septum and eardrum. Skin or dermal exposure can cause skin irritation, ulceration, sensitization, and allergic contact dermatitis.

Breathing in high levels of hexavalent chromium can cause irritation to the nose and throat. Symptoms may include runny nose, sneezing, coughing, itching and a burning sensation. Repeated or prolonged exposure can cause sores to develop in the nose and result in nosebleeds. If the damage is severe, the nasal septum (wall separating the nasal passages) develops a hole in it (perforation).

Some employees can become allergic to hexavalent chromium so that inhaling chromate compounds can cause asthma symptoms such as wheezing and shortness of breath. Some employees can also develop an allergic skin reaction, called allergic contact dermatitis. This occurs from handling liquids or solids containing hexavalent chromium. Once an employee becomes allergic, brief skin contact causes swelling and a red, itchy rash that becomes crusty and thickened with prolonged exposure. Allergic contact dermatitis is long-lasting and more severe with repeated skin contact. Direct skin contact with hexavalent chromium can cause a non-allergic skin irritation. Contact with non-intact skin can also lead to chrome ulcers. These are small crusted skin sores with a rounded border. They heal slowly and leave scars.

3.1.2.4 **Lead exposures** interfere with a variety of body processes. Lead is toxic to many organs and tissues including the heart, bones, intestines, kidneys, and reproductive and nervous systems. It interferes with the development of the nervous system and is therefore particularly toxic to children, causing potentially permanent learning and behavior disorders. Symptoms of lead exposure include abdominal pain, confusion, headache, anemia, irritability, and in severe cases, seizures and coma.

Routes of exposure to lead include contaminated air, water, soil, food, and consumer products. Occupational exposure is a common cause of lead poisoning in adults. According to estimates made by the National Institute for Occupational Safety and Health, more than 3 million workers in the U.S. are potentially exposed to lead in the workplace.

Elevated lead in the body can be detected by the presence of changes in blood cells visible with a microscope and dense lines in the bones of children seen on X-ray. However, the main tool for diagnosis is laboratory measurement of the lead levels in the blood or urine. When blood lead levels are recorded, the results indicate how much lead is circulating within the blood stream, not the amount being stored in the body. Blood lead levels are reported as micrograms of lead per deciliter (µg/dl) of whole blood. The Center for Disease Control (CDC) has set the standard elevated blood lead level for adults to be 25 (µg/dl) of the whole blood. For children however, the number has been set much lower at 5 (µg/dl) of blood (CDC, October 30, 2012).

Children are especially prone to the health effects of lead and as a result, blood lead levels must be set lower and closely monitored if exposures to lead are possible. The major treatments for lead poisoning are removal of the source of lead or chelation therapy (administration of agents that bind lead so it can be excreted from the body). However, chelation therapy has risks due to the ingestion of the chelating chemical and chelation is only used in extreme circumstances.

Humans have been mining and using this heavy metal for thousands of years, poisoning themselves in the process. Although lead poisoning is one of the oldest known work and environmental hazards, the modern understanding of the small amount of lead necessary to cause harm did not come about until the latter half of the 20th century. No safe threshold for lead exposure has been discovered—that is, there is no known amount of lead that is too small to cause the body harm. Even though the CDC recommends that adult blood lead levels be kept below 25 µg/dl, there are medical indications that even these levels may cause harm to the body.

3.1.2.5 **Manganese** exposures can lead to a variety of psychiatric and motor skill disturbances, termed manganism. Generally, exposure to air concentrations in excess of 5 micrograms per cubic meter (µg/m^3) can lead to symptoms. In the initial stages of manganism, neurological symptoms consist of reduced response speed, irritability, mood changes, and compulsive behaviors. Upon prolonged exposure symptoms are more prominent and resemble those of Parkinson's disease, which it is often misdiagnosed as, although there are particular differences in both the symptoms (nature of tremors, for example), response to drugs such as levodopa, and affected portion of the nerve fibers in the brain. Symptoms are also similar to Lou Gehrig's disease and multiple sclerosis.

3.1.2.6 **Mercury** exposure causes damage to the brain, kidneys, and lungs. Mercury poisoning can result in several diseases as well as sensory impairment (vision, hearing, speech), disturbed sensations, and a lack of coordination. The type and degree of symptoms exhibited depend upon the dose and the method and duration of exposure. The earth's atmosphere contains small, but measurable, amounts of mercury from vaporization and dispersal from natural sources on the earth's surface. Soil and rock can contain about 0.2 micrograms of mercury per gram of substance. Additionally, emissions from oil and coal fuel sources release airborne contaminants of mercury into our air. Ambient levels of mercury vary from nearly non-detectable levels in remote regions to as high as 0.6 micrograms per cubic meter (µg/m^3) in industrial areas. Data indicate that background average concentrations of mercury vapor are approximately 0.012 µg/m^3.

Mercury can be absorbed through the skin, ingested, and, most commonly, inhaled. The kidneys accumulate the highest concentrations of mercury from the body, usually resulting in permanent kidney damage.

Common symptoms of mercury poisoning include loss of sensation of touch; itching, burning or pain; skin discoloration (pink cheeks, fingertips and toes); swelling; and shedding of skin. More severe exposures may cause profuse sweating, persistently faster-than-normal heart beat, increased salivation, and increased blood pressure levels. Prolonged exposures lead to kidney dysfunction or central nervous system symptoms such as emotional instability, memory impairment, or insomnia.

In late 1800's England, mercury was used extensively in the fur & felt hat industries. They would put metal bars on the 2nd or 3rd story windows to keep the employees from running to the windows and jumping out to their deaths. Hence the term: "Mad as a Hatter" illustrated in Lewis Carroll's *Alice in Wonderland*.

3.1.2.7 **Nickel** exposures can affect the cardiovascular system, kidneys, and central nervous system in humans. It is a potent sensitizing agent causing mild to severe allergic reactions upon exposure. Although nickel compounds are not absorbed in sufficient concentration through the skin to cause body toxicity, they are capable of inducing contact dermatitis in sensitized individuals. Many epidemiology studies attest to the potential human carcinogenicity by nickel compounds. The International Agency for Research on Cancer (IARC) has concluded that there is sufficient evidence that nickel and some of its compounds can cause cancer of the nasal cavity and lung, and possibly of the larynx in refinery workers.

3.1.2.8 **Silver** exposures cause a condition called "argyria" which causes the skin to change color to a blue or bluish-gray. It may also affect the eyes. In humans, silver accumulates in the body over time. Generally, silver exhibits low toxicity in the human body, and minimal risk is expected at CAP due to the low levels of workplace exposures and intermittent use of silver containing compounds (silver solder).

3.1.2.9 **Zinc** metal in the body causes a flu-like illness called metal fume fever. Symptoms of metal fume fever included headache, fever, chills, muscle aches, nausea, vomiting, weakness, and tiredness. The symptoms usually start several hours after exposure. The attack may last 6 to 24 hours. Metal fume fever is more likely to occur after a period away from the job (after weekends or vacations). High levels of exposure to zinc oxide fumes may cause a metallic or sweet taste in the mouth, dryness and irritation of the throat, and coughing at the time of exposures.

3.2 ***Responsibilities/etc.*** Supervisors and/or Managers have the responsibility to identify work practices and/or procedures which could expose CAP employees to heavy metals in the workplace. Any

suspicious materials should be identified to the Environmental, Health, and Safety (EH&S) Department for evaluation by appropriate sample collection and laboratory analysis.

When a material is believed to contain a listed heavy metal it is the EH&S Department's responsibility to determine the exposure risk for the employees working with or around this material. The Baseline Hazard Assessment will detail the potential for exposure and document the risk or hazard. The Assessment will also provide guidance on controlling potential inhalation or ingestion of metal fumes or dusts as well as procedures for personal hygiene to prevent removal of the hazard from CAP property on personal clothing or vehicles.

3.3 *Basis of Initial Determination*

To meet compliance with the OSHA standards for worker exposures and to ensure that CAP workers are not exposed to hazardous levels of heavy metals, an initial assessment must be made of work activities where heavy metals could potentially be released to the work area. To accomplish this, all work activities must be evaluated by the Senior Industrial Hygienist or his/her designee. This evaluation will consist of a Baseline Hazard Assessment in which the work activity will be reviewed, in detail, and air sampling will be performed to determine the airborne metal concentrations to which the employee could be exposed. Additional sampling for environmental metal hazards may also be conducted during the Initial Determination to assess the potential for other releases of metals to the work area.

Results of the Baseline Hazard Assessment will report the health risk associated with the metal hazard and provide detailed recommendations on the protective measures required to reduce and/or eliminate the health risk. These will include:

1. recommended engineering controls such as ventilation or tool replacement that will significantly reduce or completely eliminate the risk of exposure;
2. recommended administrative controls such as substitution of products, rotation of workers, changes to work practices, and housekeeping that will further reduce the risk of exposures; and
3. recommended personal protective equipment, including respirators, that will protect the worker until feasible engineering and/or administrative controls can be modified, improved, or implemented.

3.4 Regulated Areas

The term "regulated area" is defined as an area, demarcated as a result of the Baseline Hazard Assessment, where an employee's exposure to airborne levels of heavy metal dusts or fumes could, or reasonably be expected to, exceed the Action Level for that metal (or one-half the Occupational Exposure Limit if no specific Action Level is specified).

These areas will be defined in all workplaces where exposures to heavy metals are identified. The areas will be identified by markings on the flooring, barrier tape installed during the work activity creating exposures, signs posted in the work area, or narrative descriptions adjacent to the work

area. Exposure specific signs will also be prepared and installed in work areas where heavy metals are routinely worked (see Section 3.9 for specific wording of signs).

3.5 Protective Clothing and Equipment

Specific requirements for types of protective clothing and frequency for changing out clothing are described in the OSHA regulations for each type of metal exposure. Specific information on types of clothing and change-out frequency are detailed below in each specific metal under Methods of Compliance. In general, the requirements for protective clothing and equipment are as follows:

3.5.1 Coveralls or similar full-body work clothing will be worn by all employees working in a regulated area. Reusable abrasive blasting suits will be vacuumed off using a HEPA vacuum prior to leaving the blasting enclosure and bagged for cleaning at the end of the work task. Disposable coveralls will be bagged prior to leaving the blast enclosure or regulated area and returned to Environmental Compliance for proper disposal.

3.5.2 Gloves, shoes, or shoe coverlets will be worn by all employees working in a regulated area. Gloves and shoe coverlets will be HEPA vacuumed and bagged prior to leaving the regulated area and returned to Environmental Compliance for proper disposal.

3.5.3 Face shields and/or vented goggles will be used to protect the face and eyes from heavy metal dusts and fumes. Full-face respirators provide similar eye protection. These PPE items will be cleaned with a wet cloth and cleaning solution as needed, or minimally at the end of each shift, and stored in a clean zip-locking plastic bag.

3.5.4 Cleaning and/or replacement of all PPE. Employees are required to keep PPE in clean working condition at all times. If PPE becomes defective during use, the item is to be replaced as soon as practicable.

3.6 Housekeeping

3.6.1 All CAP employees who work in areas where heavy metal dusts or fumes may accumulate will ALWAYS wash their hands, arms, and face when leaving a work area for breaks, lunch, and at the end of a workday. The purpose of this practice is to prevent the ingestion of heavy metals during the act of eating, drinking, smoking, or applying cosmetics or lip balms. In addition, the practice will reduce the likelihood of carrying trace levels of heavy metals away from the workplace and into the home where children and/or grandchildren may be exposed. Small children, because of the smaller body mass, are much more susceptible to the adverse health effects of ingested metals. Adults ingesting 5 micrograms of a metal dust may not affect the function of any body organ or metabolic activity. However, the same amount of metal ingested by a 2 year old child over the course of a few days could cause multiple health problems.

3.6.2 Surfaces. All surfaces within the regulated area must be maintained as free as practicable of accumulations of heavy metals. In practice, floors and other horizontal surfaces will be cleaned at the end of a work shift with wet cloths which are immediately disposed of in labeled waste

containers. Waste containers will be covered between use (daily) and removed for disposal to Environmental Compliance as needed. Vacuum and vacuum tools will be cleaned, filters changed, and cabinets decontaminated as needed.

3.6.3 Periodic evaluations by the Sr. Industrial Hygienist will use wipe sampling and laboratory analysis to determine the surface contamination of heavy metals. OSHA regulations for arsenic, cadmium, chromium, and lead require that the work areas' surfaces be maintained as "free as practicable" (see definitions – Attachment B) from accumulations of these metals.

3.6.4 In work areas where arsenic, cadmium, chromium, or lead are encountered the area should receive a thorough cleaning at least once per month. This should include HEPA vacuuming of surfaces likely to be contaminated with metal dusts/fumes, wet mopping of finished flooring (break rooms, bathroom, clean rooms, etc.), and wet wiping of horizontal surfaces likely to have settled surface dusts containing the above metals. This should include equipment tops adjacent to the Abrasive Blast Booth and reachable surfaces in the Fab Shop. Extra cleaning is recommended at least annually for normally "non-reachable" surfaces such as crane rails, light fixtures, ventilation ducts, and mezzanine floors.

3.7 Hygiene Facilities and Practices

3.7.1 Change Rooms. Change rooms will be provided at all regulated areas allowing employees to change from street clothes to protective clothing. Change rooms must have storage bins for maintaining separation between clean and contaminated clothing.

3.7.2 Showers. Shower facilities with soap will be provided when skin or eye contact with heavy metal dust or fumes are generated. Shower facilities will meet the requirements of OSHA regulations §1910.141(d)(3). Facilities must also be available for employees to wash their hands and face when leaving a regulated area.

3.7.3 Lunchrooms. Eating facilities must be made available when employees are working in regulated areas. Tables for eating will be maintained free of heavy metals. Employees will not enter lunchrooms with protective work clothing or equipment. In remote locations where changing work clothing is restricted the clothing must be carefully HEPA vacuumed to prevent dispersal of metal dusts or fumes.

3.7.4 Lavatories. CAP will provide lavatory facilities which comply with §1910.141(d)(1) and (d)(2).

3.7.5 Vacuuming clothing. CAP will provide a HEPA vacuum adjacent to the regulated area for employees to vacuum the dust from disposable or reusable protective clothing prior to leaving the regulated area.

3.8 Medical Surveillance (General)

3.8.1 Medical Monitoring

OSHA standards exist for several of the heavy metals covered by this program including arsenic, cadmium, chromium, and lead. These standards define substance-specific actions that must be taken when workers are exposed to these metals. Those actions are identified below for the four metals regulated by OSHA. For the remaining metals covered by this program, medical monitoring criteria have been incorporated from guidance provided by the National Institute for Occupational Safety and Health Criteria Documents for Recommended Standards and the American Conference of Governmental Industrial Hygienists Documentation of Threshold Limit Values® and Biological Exposure Indices®.

3.8.1.1 Medical Monitoring consists of a physical examination and other testing by a licensed physician to evaluate for evidence of exposures to heavy metals. Certain medical conditions which affect the muscles, nerves, lungs, circulation, and other body systems become evident when exposures to metals become excessive. By conducting periodic examinations to look for these medical conditions the workers risk of organ damage is reduced. Most medical examinations are conducted annually but may be more frequent if indications of high exposures are found. Specific frequencies and procedures are defined within the sections below for each of the specific metals.

3.8.2 Biological Monitoring

When workers are exposed to heavy metals by inhaling, swallowing, or adsorbing dusts and fumes the metal enters various organs via the circulation systems of the body. As the amount of metal circulating in the body increases the risk for harm to various body organs is also increased. Air sampling to measure exposures is a useful index of potential exposure but does not indicate the actual risk to the employee. Biological monitoring is a means of identifying the actual amount of metal accumulated within the body and therefore a more reliable means of identifying risk.

3.8.2.1 Biological Monitoring involves collection of biological samples from an exposed employee and conducting laboratory testing to determine the quantity of a particular metal that is circulating within the employee's body systems. Some biological sampling may draw blood samples while others may be hair, urine, or saliva samples. The amount of metal within the biological sample is compared to a chart of risk. Actions can then be initiated to reduce risk and better protect the employee. Specific biological samples and testing frequencies are listed below in the section for each heavy metal.

3.9 Signs and Labels

Signs and labels are a means to identify to the employee the areas where exposures to heavy metals can occur. They are intended as a form of training for all employees, not just those who work with the heavy metals.

DANGER
HEAVY METALS EXPOSURE
POSSIBLE CANCER HAZARD
AUTHORIZED PERSONNEL ONLY
NO SMOKING OR EATING
RESPIRATOR REQUIRED

3.9.1 Signs. Signs bearing the above wording will be posted in all regulated areas where heavy metals exposures are anticipated to occur. Signs will be maintained clean and legible and protected from damage due to work activities in the area.

3.10 Recordkeeping

OSHA regulation 1910.1020 requires CAP to keep all air sampling and medical surveillance records for exposures to workplace hazards. Generally, this requires retention of records for the length of the employee's employment plus an additional 30 years. Records to be retained include all air samples collected to evaluate breathing-zone air concentrations, sample pump calibration data, laboratory analysis reports, any calculations to evaluate 8-hour Time Weighted Average (TWA) exposures, and any employee notifications of exposure. Medical surveillance records, including physician exam results and biological monitoring, are also required to be kept for each employee having exposures to heavy metals.

3.11 Observation of Monitoring

CAP will provide all exposed employees or their designated representative an opportunity to observe any activity related to air sample collection and laboratory analysis of air samples. It is understood that, if an employee or their representative, wants to enter into a regulated area to observe activities then the person must be protected to the same extent as the exposed employee. That is, they must be able to don and effectively wear the appropriate respirator and other protective equipment worn by the exposed employee.

The observer will also be entitled to receive an explanation of the measurement procedures, observe all steps related to the monitoring conducted at the place of exposure, examine records of the results obtained, and/or receive copies of the results returned by the laboratory.

4.0 ARSENIC EXPOSURES

4.1 Arsenic at CAP

Current Baseline Hazard Assessment information indicates the only products or equipment components known to contain arsenic are the abrasive grit used at the Headquarters Abrasive Blast Booth and at field locations where abrasive blasting is conducted by the Protective Coatings Group. A review of all MSDSs (SDSs) received and entered in LiveLink since 2007 found no reference to arsenic. Additional

arsenic exposures can occur during welding operations. The base metal being welded could contain trace levels of arsenic as a contaminant of recycled metals used in the steel making process.

All air monitoring conducted by the Environmental, Health, and Safety (EHS) Department in any of the work operations listed have not found airborne levels of arsenic that exceed any of the action criteria for any of the listed Occupational Exposure Limits. CAPs Industrial Hygienists will continue to evaluate worker exposures to arsenic in these areas to ensure employees are protected from the effects of arsenic exposure.

4.2 Occupational Exposure Limits (OELs)

4.2.1 OSHA PEL

Exposures to arsenic are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1018, including Appendices A, B, and C. The PEL for arsenic is set at 10 micrograms of arsenic per cubic meter of air (µg/m^3), as an 8-hour Time-Weighted Average (TWA). The OSHA standard has an Action Level of 5 µg/m^3, also as an 8-hour TWA.

4.2.2 ACGIH TLV®

The TLV® for arsenic was last updated by the ACGIH TLV Committee in 1990. This committee has labeled arsenic as a known human lung carcinogen and has set a TLV® of 0.01 mg/m^3 (10 µg/m^3) as an 8-hour TWA. **Although the TLV® and the PEL are the same, CAP will use the TLV as our OEL as the TLV® may be updated more frequently than the PEL.**

4.2.3 Other OELs

NIOSH has set a REL for arsenic at 0.002 mg/m^3 (2 µg/m^3) as a 15-minute Ceiling exposure. All formal cancer research organizations (EPA, NIOSH, IARC, and the NTP) recognize arsenic as a human carcinogen. Current limit of quantitation for arsenic, using a modified NIOSH 7300 method is 0.075 micrograms per sample, or less than 0.1 µg/m^3 for an 8-hour air sample.

4.3 Initial Exposure Determination

4.3.1 Exposure Monitoring. Periodic air sampling will be conducted by the Environmental, Health, and Safety Department Senior Industrial Hygienist. Sampling frequency will be determined based on previous airborne concentrations. At the time of this program development air sampling had not documented airborne concentrations of arsenic which exceeded one-half of the OSHA Action Level, or were less than 2.5 micrograms per cubic meter of air.

Any air monitoring (positive or negative) to determine worker exposures to arsenic will include a written report of findings, submitted to the workers supervisor and management. Employees monitored for potential arsenic exposures will be notified, in writing, within 15 working days after receipt of laboratory analytical results by CAP industrial hygienists.

4.4 Methods of Compliance

4.4.1 Engineering Controls. All abrasive blasting work will be conducted inside a ventilated enclosure. This may be a temporary unit built to enclose a piece of equipment or it may be the equipment itself (discharge line or manifold). In all cases the enclosure must be ventilated either with a negative pressure HEPA filtered fan system or a positive pressure blasting area, exhausted to the outdoors. At no time should the exhaust to the outdoors be located near other occupied buildings.

4.5 Respiratory Protection

4.5.1 All abrasive blasting with grits containing arsenic metal and all welding operations using consumables containing greater than 0.01% arsenic requires the use of respiratory protection. All abrasive blasting requires the use of a supplied air full-face abrasive blasting hood. Welding operations involving arsenic metal requires the use of a powered air-purifying respirator welding hood and use of a portable high-efficiency filtration ventilation system. Grinding or torch cutting of arsenic containing metals requires the use of a full-face air-purifying respirator with P-100 filters.

4.5.2 Respiratory protection worn in the regulated area will meet the OSHA respiratory standard, §1910.134, and CAPs Written Respiratory Protection Program.

4.6 Medical Surveillance

4.6.1 Arsenic Medical Surveillance Program.

4.6.1.1 Program Inclusion: Any CAP employee exposed to arsenic dusts or fumes at levels exceeding 5 $\mu g/m^3$ for 20 or more days in any 12 month period.

4.6.1.2 Program Components. Details of the program are available on the CAP Safety Resource Center web page or from the Environmental, Health, and Safety Department Industrial Hygienist. The program consists of the following items:

- Initial Examination by Physician
- Medical history of arsenic exposure
- Nasal and skin examination
- Work history of arsenic exposures
- Option for chest x-ray
- other exams as determined by doctor

4.6.2 Biological Monitoring. The ACGIH Biological Exposures Indices (BEI®) provides for biological measurement of arsenic exposure. Arsenic, measured in urine collected at the end of shift, has a BEI® of 35 micrograms of metal per liter of urine. BEI® measurements should be a component of any medical surveillance program for arsenic exposed workers.

5.0 CADMIUM EXPOSURES

5.1 Cadmium at CAP

Cadmium occurs as a minor component in most zinc ores and therefore is a byproduct of zinc production. It was used for a long time as a pigment in coatings and for corrosion resistant plating on

steel. With the exception of its use in NiCad batteries and solar panels, the uses of cadmium is generally decreasing. These declines have been due to competing technologies and cadmium's high toxicity resulting in more strict regulations on its use.

Cadmium is one of six substances banned by the European Union's "Restriction on Hazardous Substances (RoHS) directive, which bans certain hazardous substances in electrical and electronic equipment but allows for certain exemptions and exclusions from the scope of the law.

Cadmium is still used, in limited amounts, in paint pigments such as reds, yellows, and oranges. It can also be found in some silver solders, brazing filler wire, and some zinc alloys. Cadmium is used in bearing alloys, due to a low coefficient of friction and fatigue resistance. Additionally, cadmium can be found in cadmium-plated hardware and fittings. Any use of these items at CAP should require a manufacturer's SDS (or older MSDS) to identify the presence of cadmium.

A review of all SDSs (or MSDSs) for silver solder or brazing wire currently (2013) stored in LiveLink since 2008 does not indicate cadmium as a component of the product. Currently there is no known use of cadmium or any products other than nickel-cadmium batteries on CAP property. Should any new uses of cadmium or cadmium containing products be introduced into the CAP workplace the following guidelines, OELs, and/or medical procedures will be followed.

5.2 Occupational Exposure Limits

5.2.1 OSHA PEL

Exposures to cadmium are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1027, including Appendices A through F. The PEL for cadmium is set at 5 $\mu g/m^3$ as an 8-hour Time Weighted Average (TWA), with an Action Level of 2.5 $\mu g/m^3$, also as an 8-hour TWA.

5.2.2 ACGIH TLV®

The TLV® for cadmium was last updated by the ACGIH TLV Committee in 1990. This committee has labeled cadmium as a suspect human lung carcinogen and has set 8-hour TWA TLVs® of 0.01 mg/m^3 (10 $\mu g/m^3$) as a total dust level and 0.002 mg/m^3 (2 $\mu g/m^3$) as a respirable dust (particle sizes of approximately 10 micrometers diameter or smaller). The TLV Committee also recognizes cadmium as potentially causing kidney damage. **CAP will use the total and respirable dusts TLVs® as our OEL.**

5.2.3 Other OELs

NIOSH recommends that cadmium levels be maintained at the lowest feasible level achievable using engineering controls and work practices. The current (2013) laboratory limit of quantitation for cadmium is 0.015 micrograms per sample using the NIOSH 7300 analytical method and for an 8-hour sample at approximately 2 liters per minute this equates to an airborne concentration of 0.015 micrograms per cubic meter ($\mu g/m^3$). All formal cancer

research organizations (EPA, NIOSH, IARC, and the NTP) recognize cadmium as either a suspect or a known human carcinogen.

5.3 Initial Exposure Determination

5.3.1 Exposure Monitoring. When exposures to cadmium can occur, air sampling will be conducted by the Environmental, Health, and Safety Department Senior Industrial Hygienist. Sampling frequency will be determined based on the projected use of the cadmium product.

Any air monitoring (positive or negative) to determine worker exposures to cadmium will include a written report of findings, submitted to the workers supervisor and management. Employees monitored for potential cadmium exposures will be notified, in writing, within 15 working days after receipt of laboratory analytical results by CAP industrial hygienists.

5.4 Methods of Compliance

5.4.1 Engineering Controls. All abrasive blasting work involving cadmium will be conducted inside a ventilated enclosure. This may be a temporary unit built to enclose a piece of equipment or it may be the equipment itself (discharge line or manifold). In all cases the enclosure must be ventilated either with a negative pressure HEPA filtered fan system or a positive pressure blasting area, exhausted to the outdoors. At no time should the exhaust to the outdoors be located near other occupied buildings.

5.5 Respiratory Protection

5.5.1 Respiratory Requirements

Employees exposed to cadmium will be enrolled in CAPs Respiratory Protection Program which includes a medical surveillance physical to ensure fitness to wear respiratory protection, training for understanding of the respirator functions, and quantitative fit-testing to ensure adequate protection by the selected respirator. Supplied-air abrasive blasting respirators will be used by all personnel conducting abrasive blasting operations.

5.6 Medical Surveillance

5.6.1 Medical Monitoring. Medical monitoring for exposures to cadmium are required for any employee exposed at or above the OSHA Action Level for 30 or more days during any 12 month period. Any employee identified to have any exposure to cadmium which exceeds the Action Level will be placed into the Medical Surveillance program to establish a Baseline Medical Examination. They will be re-evaluated at least annually for any exposures which equal or exceed 2.5 µg/m^3 for 30 or more days in a one-year period. The Medical Surveillance will consist of those items listed in the OSHA cadmium standard at 29 CFR 1910.1027(m)(2) – (5).

5.6.2 Biological Monitoring. The ACGIH Biological Exposures Indices (BEI®) provides for biological measurement of cadmium exposure. Biological measurement of cadmium body levels can be

measured in a urine sample and has a BEI® of 5 micrograms of cadmium per gram of creatinine. Blood testing can also evaluate exposures with a BEI® of 5 micrograms of cadmium per liter of blood. BEI® measurements should be a component of any medical surveillance program for cadmium exposed workers.

6.0 CHROMIUM EXPOSURES

6.1 Chromium at CAP

The focus of controlling chromium exposures at CAP will focus on the hexavalent form of chromium, commonly referred to as CrVI. A significant amount of structures and equipment such as the pumps in the pumping plants contain large amounts of stainless steel. Welding, grinding, and sanding activities during maintenance work releases CrVI into the breathing zones of the workers. This exposure control program is designed to reduce or eliminate these exposures to CrVI.

Baseline Hazard Assessment information indicates that exposures to hexavalent chrome occur during any welding process using rod or wire that contains any level of chrome or during any welding or grinding work on stainless steel stock metal. These exposures include work done at Headquarters Fab Shop and Machine Shop as well as field locations where welding is conducted with chrome rods or wire or welding/grinding on stainless steel such as cavitation repair on the impellers.

Air sampling during these work activities have been below the OSHA PEL and/or TLV® when adequate ventilation controls are in place. However, when local exhaust ventilation is not used exposures can reach 2 to 3 times the OSHA PEL. Exposures to any chromium metal while conducting work at CAP almost always exceeds the CAP Action Level (see below) and therefore respiratory protection must be worn when welding or grinding on stainless steel or using chrome containing welding wire or rods.

6.2 Occupational Exposure Limits

6.2.1 OSHA PEL

Exposures to hexavalent chromium are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1026, including Appendix A. The PEL for hexavalent chromium is set at 5 µg/m^3 as an 8-hour Time Weighted Average (TWA), with an Action Level of 2.5 µg/m^3.

6.2.2 ACGIH TLV®

The TLV® for hexavalent chromium was last updated by the ACGIH TLV Committee in 1991. This committee has labeled hexavalent chromium as a known human lung carcinogen and has set a TLV® of 50 µg/m^3 8-hour TWA for water-soluble forms and 10 µg/m^3 8-hour TWA for insoluble hexavalent chromium compounds.

6.2.3 Other OEL

NIOSH recommends that CrVI levels be maintained at the lowest feasible level achievable using engineering controls and work practices. The current (2013) limit of quantitation (LOQ) for total CrVI, using OSHA ID-215 analytical methods, is 0.025 µg. For an 8-hour air sample of

approximately 2 liters per minute, this LOQ equates to an airborne concentration of 0.025 µg/m^3. Soluble CrVI has a LOQ of 0.05 µg per sample using NIOSH 7600 analytical method. All formal cancer research organizations (EPA, NIOSH, IARC, and the NTP) recognize CrVI as a suspect or a known human carcinogen. **CAP will use the NIOSH REL with a quantitative number of 1.0 µg/m^3 as our Occupational Exposure Limit to ensure exposures are kept as low as possible. Additionally, CAP has set an Action Level of 0.05 µg/m^3 (approximate limit of detection) and requires use of engineering controls and respirators when concentrations exceed the Action Level.**

6.3 Initial Exposure Determination

6.3.1 Exposure Monitoring. The Environmental, Health, and Safety Department Senior Industrial Hygienist has sampled such operations as welding on stainless steel and welding with chrome containing rods/wire. These air samples indicate exposures in the range of non-detectable to as high as 15 µg/m^3. Air sample results of welding operations without the use of ventilation controls were usually greater than 2 µg/m^3. When local exhaust ventilation was used (at the point of fume generation) results were below 2 µg/m^3.

Dates of welding in the Fab Shop indicate that welding with chrome rod or welding on stainless steel occurs less than 30 days in any 12 month period. The same applies to the Heavy Overhaul Group and their work grinding and welding the stainless steel impellers. This work happens once or twice a year with an exposure period of 4 to 6 days. Exposure monitoring during cavitation work on the impellers found exposure levels of less than 0.03 µg/m^3 up to a high of 0.236 µg/m^3. Initial exposure determinations found exposures were usually below the OSHA Action Level of 2.5 µg/m^3 but were usually above CAPs Action Level of 0.05 µg/m^3. Therefore, all welding or grinding work on stainless steel and all welding with chrome rod or chrome wire must be done with local exhaust ventilation and respiratory protection (see Section 6.5 below).

Any air monitoring to determine worker exposures to CrVI will include a written report of findings, submitted to the workers supervisor and management. Employees monitored for potential CrVI exposures will be notified, in writing, within 15 working days after receipt of laboratory analytical results by CAP industrial hygienists.

6.4 Methods of Compliance

6.4.1 Engineering Controls. All grinding or welding work with chromium metal or stainless steel will be conducted using local exhaust ventilation controls. Contact the Sr. Industrial Hygienist for specific work activities to ensure the maximum benefit from the available ventilation technology. The Headquarters Fab Shop has a programmable "smoke-eater" which follows the welding action to ensure best capture of welding fumes. Other local exhaust ventilation is available which is capable of drawing up to 2000 cubic feet of air per minute away from the worker's breathing zone.

6.5 Respiratory Protection

Respiratory protection requirements for hexavalent chromium (CrVI) are broken down by the type of work activity being conducted and the expected time frame for the work. When local exhaust ventilation is used with respiratory protection, the respirator requirements are listed as follows:

6.5.1 When metal filing, grinding, or welding with chrome rod/wire or work on stainless steel for less than 1 hour per workday, the employee(s) MUST WEAR, at a minimum, a disposable Moldex 2360 disposable P-100 respirator (#8010-0054) or a 3M 8293 disposable P-100 respirator (#8010-0031). To wear a P-100 disposable respirator the employee MUST be fit-tested for that particular unit within the last 12 months. Employees may also wear a half-mask or full-face air-purifying respirator with P-100 cartridges, or a PAPR welding helmet. The tight fitting air-purifying respirators must also be fit-tested before use and annually thereafter.

6.5.2 When metal filing or grinding on stainless steel or chromed surfaces and work will last longer than 1 hour per workday, then the employee(s) MUST wear a half-mask or full-face air-purifying respirator with P-100 cartridges.

6.5.3 When welding work will last longer than 1 hour per workday, the employee(s) MUST wear a PAPR welding helmet with clean P-100 cartridges. Total exposure time for each P-100 cartridge must be less than 24 hours of weld time when ventilation controls are in use. If no ventilation is in use the P-100 cartridges must be changed after 10 hours of use.

6.6 Medical Surveillance

6.8.1 Medical Monitoring. Medical monitoring for exposures to CrVI are required for any employee exposed at or above the OSHA Action Level for 30 or more days during any 12 month period. Any employee identified to have any exposure to CrVI which exceeds this exposure criteria will be placed into the Medical Surveillance program to establish a Baseline Medical Examination. They will be re-evaluated at least annually for any exposures which equal or exceed 2.5 µg/m^3 for 30 or more days in a one-year period. The Medical Surveillance will consist of those items listed in the OSHA CrVI standard at 29 CFR 1910.1026(k)(3) – (5).

- Initial Examination by Physician
- Medical history of CrVI exposure
- Skin & respiratory tract examination
- Work history of CrVI exposures
- History of respiratory dysfunction, etc.
- other exams as determined by doctor

6.8.2 Biological Monitoring. The ACGIH Biological Exposures Indices (BEI®) provides for biological measurement of hexavalent chromium (CrVI) exposure. Biological measurement of CrVI body levels can be measured in a urine sample. Two BEI®s are proposed for this metal. A BEI® of 25 micrograms of CrVI per liter of urine is recommended for an end of work week sample and a BEI® of 10 micrograms per liter for any single sample during the work week. BEI® measurements should be a component of any medical surveillance program for CrVI exposed workers.

7.0 LEAD EXPOSURES

7.1 Lead at CAP

Worker exposures to lead at CAP are limited and currently (2014) only two work operations present the potential for employee lead exposures: abrasive blasting of red, lead-primered metal surfaces and soldering of electronic circuit boards. The greatest exposures occur in the abrasive blasting booth at the Headquarters Maintenance Building Addition. Occasionally, non-removable pumping equipment needs repainting and will be abrasive blasted in place by building a poly containment operated under negative pressure. Small areas of lead primer are sometimes removed using liquid solvents. Solvent removal has been evaluated and has shown no detectable levels of lead when the written procedures are followed (see Attachment C).

Another known source of potential lead exposure is during soldering operations using lead/tin solders. These also have been evaluated and a Negative Initial Determination (NID) was developed. These soldering operations apply only to soldering electrical components on printed circuit boards.

Headquarters Machine Shop has identified a settled lead dust problem from an unknown source. Currently it is believed that disassembly of equipment such as valves, casings, and other pumping equipment containing lead-based primer created lead paint flakes which were not efficiently collected and contained. This may have led to disbursement of lead paint by "track-out" which ground the paint flakes into airborne dusts which accumulated on horizontal surfaces over several years. Housekeeping procedures identified in this program will reduce and eliminate this lead hazard over time. High volume air sampling found no airborne concentrations of lead dust. Current settled dust levels are not expected to create health risks for employee as long as they follow the Housekeeping and Hygiene Practices identified in this program (see Section 3.6 and 3.7).

7.2 Occupational Exposure Limits

7.2.1 OSHA PEL

Exposures to lead are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1025, including Appendices A through D. The PEL for lead is set at 50 µg/m^3 as an 8-hour Time-Weighted Average (TWA), with an Action Level of 30 µg/m^3. **CAP will use the OSHA PEL as our OEL including the Action Level.**

7.2.2 ACGIH TLV®

The TLV® for lead was last updated by the ACGIH TLV Committee in 1991. This committee has labeled lead as a known animal carcinogen with unknown relevance to humans. A TLV® has been set at 50 µg/m^3 as an 8-hour TWA. It is interesting to note in the ACGIH Documentation of Threshold Limit Values® that an airborne concentration of 50 µg/m^3 is capable of producing a blood lead level of approximately 30 µg/deciliter of whole blood.

7.2.3 Other OEL

NIOSH has published a criteria document on controlling lead exposures and has a Recommended Exposure Limit of 50 µg/m^3 as an 8-hour TWA.

7.3 Initial Exposure Determination

Until the Baseline Hazard Assessment is completed the risk of lead exposure cannot be determined. As it is still necessary to protect the employee from lead exposure hazards CAP must "assume" some level of exposure exists and set guidance for engineering and PPE controls. In work activities where the work must be undertaken before an Initial Exposure Determination can be completed, assistance in developing these assumptions is provided in the OSHA construction standards and consists of the following statements.

7.3.1 If the work practice disturbing lead could create employee exposures that might exceed the OSHA PEL of 50 µg/m^3 but would be less than 10 times the PEL (< 500 µg/m^3), CAP will comply with 29 CFR 1926.62(d)(2)(v). (see Section 7.4.1.1 below)

This requires that proper respirators be provided and worn (see Section 7.5); coveralls, gloves, and other PPE must meet OSHA's paragraph 1926.62(g); changing areas and hand washing facilities must be provided and used; biological monitoring must be available to employees; and employee information and training (see Section 13.0) must be provided.

7.3.2 If the work practice disturbing lead could create employee exposures that might exceed 10 times the PEL (> 500 µg/m^3), CAP will again comply with 29 CFR 1926.62(d)(2)(v) and CAP's Written Respiratory Protection Program utilizing full-face air-purifying respirators with P100 cartridges. These work practices are only expected during abrasive blasting or mechanical grinding or sanding of lead-based painted surfaces. Once an Initial Determination has been made then protective measures will be assigned based on the results of that Initial Determination. (see Section 7.4.1.2 below)

7.3.3 For work practices which could create exposures that might exceed 50 times the PEL (> 2,500 µg/m^3), CAP employees will wear a supplied air respirator and comply with 29 CFR 1926 (d)(2)(v) and CAP's Written Respiratory Protection Program. These work practices are not expected to occur at CAP except during abrasive blasting of lead-coated surfaces inside a small enclosed/confined space. Currently (2014) there are no known lead-coatings inside confined spaces which would be abrasive blasted in-place.

7.4 Methods of Compliance

7.4.1 Lead-Based Coatings (Paints) Removal

Lead-based painted surfaces can contain high concentrations of lead; sometimes as high as 60% of the weight of the paint is lead. It can also contain very low concentrations of lead. The Consumer Product Safety Commission (CPSC) states in a 1978 rule that consumer paints containing less than 0.06% lead would not be considered lead-based paint. Industrial paints

can contain any concentration of lead. The EPA definition of lead-based paint is 0.5% or greater. OSHA does not define a percentage of lead for lead-based paint. Instead OSHA states that inhalation exposures be kept below the PEL by means of engineering controls. If engineering controls cannot reduce exposures to an acceptable level then respiratory protection must be used.

Testing a painted surface for lead-based paint is more complex than rubbing a stick from a Lead Test Kit and stating that since it did not turn color there is no lead present in the sample. Often the lead is not fully accessible to the test stick or the concentration of lead is too low to be detected by the test stick. Low concentrations of lead in a coating can still create airborne lead concentrations which could pose a hazard to workers. In addition, current research indicates that the PELs and TLVs® for lead may still be too high to protect all workers from adverse health effects.

7.4.1.1 Work practices which could create exposures greater than the PEL but less than 10 times the PEL will require use of the following:

- foot covering (may be included with coveralls),
- availability of showering and washing facilities,
- full-face air-purifying respirators with P100 cartridges,
- breathable disposable coveralls (#8001-0008, -0010, or -0012), and
- gloves, appropriate for the work operations, to be disposed of after work.

7.4.1.2 Abatement by abrasive blasting. Exposures during abrasive blasting of lead-based painted surfaces in the Headquarters Blast Booth will likely exceed 10 times the OSHA PEL for lead, reaching concentrations of 1500 µg/m^3. During blasting of these lead coatings employees will wear or use the following protective measures:

- breathable disposable coveralls (#8001-0008, -0010, or -0012),
- Apollo or Nova positive-pressure supplied air abrasive blasting hoods,
- heavy abrasive blasting coveralls or other protective clothing,
- leather gloves, appropriate for the work operations,
- availability of showering and washing facilities,
- steel toed safety shoes in good condition, and
- a negative pressure containment with a pressure differential of at least -0.04 inches water pressure or greater.

7.4.1.3 Abatement by solvent cleaning. A written procedure has been developed and is stored in LiveLink in the Safety Resource Center in a folder titled "Procedures". The document is called "Procedures for Solvent Removal of LBP". A copy of this procedure is included as Attachment C. Air sampling has documented that use of this procedure allows for removal of up to 4 square feet of lead-based paint without detectable levels of lead in the breathing zone of the worker. This means the airborne concentration

would be less than 0.001 µg/m^3. Respiratory protection is not required when using this procedure for lead paint removal. Other PPE is required by the procedure and personal hygiene is required after removal of the paint.

7.4.2 Lead Soldering Operations. A written procedure has been developed and is stored in LiveLink in the Safety Resource Center in a folder titled "Procedures". The document is called "Procedures for Soldering with Lead/Tin Solder". Using this procedure allows the use of lead/tin solder only when soldering electronic components on printed circuit boards. Solder must not contain more than 60% lead and the soldering iron or portable butane torch must operate at temperatures of less than 800° F. Soldering work must be greater than 12 inches below eye level (12 inches away from the nose and mouth). Soldering work must not exceed 30 minutes in a 10 hour workday and the employee will wash their hands and forearms at the end of the soldering operation.

A Negative Initial Determination was conducted on this work operation in 2010 and no circuit board soldering has taken place between then and the date of this program (2014). Any circuit board soldering, conducted according the procedures listed above would not be expected to create detectable levels of lead.

7.4.3 Headquarters Machine Shop

Wipe sampling surveys of LBP handling areas have identified settled dusts containing detectable levels of lead. These surveys have found lead levels ranging from none detect to 200 micrograms per square foot of surface area (µg/ft^2). Normally, lead removal work is not conducted in the Machine Shop. However, when LBP coated valves and other plant pieces are brought in for repair the Machine Shop may have to remove some components prior to abrasive blasting. When this occurs, paint flakes are disturbed from the surface and accumulate on the shop floor. It is assumed that the flakes are then crushed into finer dusts by foot traffic and re-suspended in the air, later settling out on other surfaces.

To reduce this risk, a written procedure has been developed to ensure that paint flakes are retained at the work site and are not tracked into other areas. This procedure is located in Attachment E and can also be found in the Safety Resource Center of LiveLink under "Procedures for Disassembly of Lead Coated Equipment".

7.4.4 Basis of an Initial Determination

The Initial Determination of potential lead exposures will be conducted by the Environmental, Health, and Safety Department as part of a Baseline Hazard Assessment. This will include an observation of the work area(s), tools and/or equipment used on the job, work practices, employee exposure monitoring, possible area monitoring, and any other data deemed necessary to accurately assess worker exposures. Employee exposure monitoring will be conduct to determine airborne concentrations for comparison to the OSHA PEL and other OELs. In addition, CAP will consider the following additional data:

- any information, observations, or calculations which would indicate an employee is exposed, or potentially exposed, to lead;
- any previous measurements conducted by the Environmental, Health, and Safety Department at CAP or any relevant objective data published by any number of safety and health organizations; and
- any employee complaints or concerns of symptoms which may be attributable to exposures to lead.

Air monitoring will be conducted on a representative number of exposed employees. In most exposure situations there is only be one employee exposed, such as abrasive blasting, paint stripping with liquid stripper, or soldering of printed circuit boards. In the event that more than one employee is exposed, CAP will monitor all employees (up to 5 each) that could have exposure to lead fumes or dusts during any work operation.

Any sampling data will be valid as an Initial Determination for a period of one year, unless work operations change in size, scope, employees, or lead source type. In those cases, a new Initial Determination will be conducted to assure that these changes did not adversely affect the exposure determination.

7.4.5 Positive Initial Determination

If any air monitoring activities determine that employee lead exposures exceed 20 µg/m^3, as an 8-hour TWA, then every work activity of that type will be monitored each time the work occurs until at least two consecutive measurements are less than 20 µg/m^3. This includes abrasive blasting operations where lead primer is blasted from metal surfaces.

Any air monitoring (positive or negative) to determine worker exposures to lead will include a written report of findings submitted to the worker's supervisor and management. Employees monitored for potential lead exposures will be notified, in writing, within 15 working days after receipt of laboratory analytical results by CAP industrial hygienists.

7.4.6 Negative Initial Determination

A Negative Initial Determination for any work operation will be valid for that work operation, work environment, work crew, and/or sampling activity for a period of 12 consecutive calendar months. If, after two consecutive monitoring activities, the work operation still does not produce levels of lead greater than 20 µg/m^3, 8-hour TWA, then that work will be designated as a Non-Lead Exposure work operation and no further monitoring will be necessary. If any component of the work operation, work environment, or work crew changes, the Environmental, Health, and Safety Department will be notified and a new Baseline Hazard Assessment will determine the potential for exposure to lead fumes or dusts and state the need for any additional air monitoring.

7.4.7 Additional Exposure Assessments

Whenever there has been a change in the process, control equipment, personnel or work practices that may result in new or additional exposures or when CAP has any reason to suspect that a change may result in new or additional exposures then additional air sampling will be conducted to document the impact of these changes.

7.5 Respiratory Protection

With three known Similar Exposure Groups (SEGs) recognized at CAP there are two requirements for respiratory protection. The first SEG is the abrasive blasters removing lead-based paints from equipment using copper slag abrasive. Exposures are typically greater than 10 times the PEL and as such, workers are required to wear supplied-air abrasive blasting respirators with a manufacturers Assigned Protection Factor of 1000. This means the respirator will reduce the airborne concentration inside the respirator to 1000 times lower than the outside levels. Based on air sampling of abrasive blasters during past lead-based paint removal this will keep the inside exposures below the OSHA PEL of 50 µg/m^3 and the Action Level of 30 µg/m^3 as 8-hour TWAs. For access to exposure monitoring data contact the Sr. Industrial Hygienist.

The second SEG is electronics technicians and engineers that are soldering components on printed circuit boards using lead-tin solder. An Initial Negative Determination during a performed "worst-case scenario" found no detectable levels of lead during soldering operations. Respiratory protection is not required during this work operation. Additionally, a written procedure has been developed which identifies the work practices that must be followed to ensure that soldering with lead-tin solder will not produce airborne levels of lead fumes. This procedure can be found in the Safety Resource Center in LiveLink in a folder titled "Procedures".

The third SEG is solvent removal of small areas of lead coatings. An Initial Negative Determination during a performed solvent removal of a 2 ft. by 2 ft. square area of a lead coated surface did not detect any measurable levels of lead. Respiratory protection is not required during this work operation. Additionally, a written procedure has been developed which identifies the work practices that must be followed to ensure that solvent removal of lead coated surfaces will not produce airborne levels of lead. This procedure can be found in the Safety Resource Center in LiveLink in a folder titled "Procedures".

7.6 Medical Surveillance

7.6.1 Medical Monitoring. Medical monitoring for exposures to lead are required for any employee exposed at or above the OSHA Action Level for 30 or more days during any 12 month period. Employees will be re-evaluated at least annually for any exposures which equal or exceed 30 µg/m^3 for 30 or more days in a one-year period. The Medical Surveillance will consist of those items listed in the OSHA lead standard at 29 CFR 1926.62(j)(1) – (3). Currently annual exposures to lead-based paint blasting operations average approximately 4 to 5 days per year.

- Initial Examination by Physician
- Medical history of lead exposure
- Work history of lead exposures
- other exams as determined by doctor

7.6.2 Biological Monitoring. The ACGIH Biological Exposures Indices (BEI®) provides for biological measurement of lead exposure. Biological measurement of body levels of lead can be measured in a blood sample. A BEI® of less than 30 micrograms (µg) of lead per 100 milliliters of blood is recommended by the ACGIH. The OSHA Standard requires removal from workplace exposures if the blood lead level (BLL) exceeds 40 micrograms per deciliter (µg/dl) of blood.

CAP will follow the *Recommendations for Medical Management of Adult Lead Exposures* published by an expert panel in 2007[1]. These recommendations are that medical removal should occur when any two consecutive BLLs, taken within 14 days, exceed 20 µg/dl or any single value exceeds 30 µg/dl. The employee will remain removed from lead exposures until the BLL level returns to below 10 µg/dl.

Recent published studies indicate that the mean BLL value in the United States is currently 1.45 µg/dl and also indicate decreased brain functions have been documented in adults with BLL of greater than 10 µg/dl. It should be CAPs goal to maintain all BLLs below 10 µg/dl. This BEI® measurements should be a component of any medical surveillance program for lead exposed workers.

8.0 MANGANESE EXPOSURES

8.1 Manganese at CAP

Manganese is a unique metal in that the body needs manganese for the metabolism of carbohydrates, amino acids, and cholesterol. It is also needed for bone development, wound healing, and reproductive functions. However, too much manganese causes severe illnesses and damage to organ tissues.

Manganese is essential to iron and steel production and all steel has low levels (8 – 10%) of manganese to improve the workability of the steel at high temperatures. Manganese is also used as an alloying agent for aluminum (approximately 1.5%). Manganese exposures at CAP can occur during welding operations when the welding rod or wire lists manganese as a component and when the base metal contains some manganese as an alloying metal.

Currently it is believed that only welding or torch cutting operations on steel or aluminum are capable of presenting CAP worker exposures to manganese. Previous monitoring of welding operations and welding fume air monitoring has documented low to moderate levels of manganese. Baseline Hazard Assessment information indicates that personnel exposures to manganese average about 0.034 mg/m^3 as an 8-hour Time Weighted Average (Inhalable fume), ranging from 0.013 to 0.098 mg/m^3. These results are all based on total particulate samples (inhalable metal). No respirable samples have yet (2014) been collected.

[1] Kosnett MJ, Wedeen RP, Rothenberg SJ, et al. Recommendations for medical management of adult lead exposure. *Environ Health Perspect.* 2007; 115(3): 463-71.

8.2 Occupational Exposure Limits

8.2.1 OSHA PEL

Exposures to manganese are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1000, Table Z-1. The PEL for manganese is set at 5 mg/m^3, as a Ceiling Value (not to be exceeded during the workday). There is no 8-hour TWA exposure limit in the OSHA regulations.

8.2.2 ACGIH TLV®

The TLV® for manganese was last updated by the ACGIH TLV Committee in 1992. This committee has found manganese to impair the central nervous system (CNS) and has set a TLV of 0.2 mg/m^3. The Committee is currently (2012) studying this metal for possible changes which would recommend a TLV® of 0.1 mg/m^3 as an inhalable metal and a TLV® of 0.02 mg/m^3 as a respirable metal. **CAP will use the TLV® as our OEL, measured as an inhalable and a respirable metal.**

8.2.3 Other OEL

NIOSH has a REL for manganese of 1 mg/m^3, as an 8-hour TWA and a STEL of 3 mg/m^3. There are no other sources of an OEL for manganese and NIOSH has not issued a Criteria Document specific to manganese.

8.3 Initial Exposure Determination

8.3.1 Initial Exposure Determinations for manganese exposures indicate 8-hour TWAs are below the TLV®, as an inhalable level. However, there have been some results that are statistically high enough to exceed this TLV®. Air monitoring for welding fumes is a continuous process in the CAP Fab Shop at Headquarters and data collection will continue to monitor for manganese, including both inhalable and respirable fumes.

8.4 Methods of Compliance

8.4.1 The greatest potential for 8-hour TWA exposures is in the Headquarters Fab Shop. Welding outside of this area is usually short term (15 minutes to less than 3 hours a day) and intermittent (fewer than 6 to 8 times per year). The Fab Shop is equipped with two large down-draft welding tables and a portable "smoke-eater" type exhaust ventilation unit. This unit is capable of about 1200 CFM ventilation capacity and has a light sensor at the pickup hood to automatically track the welding arc. Both the down-draft tables and the portable local exhaust ventilation (LEV) should be used during all welding operations. Numerous air sampling episodes have shown that the down-draft tables alone do not have the capture ability to contain welding fumes generated at more than 12 to 14 inches above the table surface. Settled welding fumes on the tops of unused horizontal surfaces (mezzanine handrails, cabinet tops, and ventilation ducts) have accumulated a considerable amount of welding dusts.

8.5 Respiratory Protection

8.5.1 Respiratory protection for manganese will follow the same guides as for any welding fume exposures. Current air monitoring does not indicate a need for respiratory protection except perhaps in confined or enclosed space (for which no air monitoring data is yet available). Welders should consider the use of respiratory protection whenever long periods of welding work are expected (i.e., greater than 4 hours of "stick-time" per workday).

8.6 Medical Surveillance

8.6.1 Medical Monitoring. No medical surveillance programs are established for exposures to manganese by OSHA or by NIOSH. Medical monitoring should be covered by our regular Welders SEG medical exams.

8.6.2 Biological Monitoring. Current technology does not allow for accurate assessment of manganese exposures based on collection of biological specimens.

9.0 MERCURY EXPOSURES

9.1 Mercury at CAP

Elemental (metallic) mercury primarily causes health effects when it is breathed as a vapor where it can be absorbed through the lungs. These exposures can occur when elemental mercury is spilled or products that contain elemental mercury break and expose mercury to the air, particularly in warm or poorly-ventilated indoor spaces. Symptoms include: tremors; emotional changes (e.g., mood swings, irritability, nervousness, excessive shyness); insomnia; neuromuscular changes (such as weakness, muscle atrophy, twitching); headaches; disturbances in sensations; changes in nerve responses; performance deficits on tests of cognitive function. At higher exposures there may be kidney effects, respiratory failure, or death.

Elemental mercury at CAP is only found in three locations: electronic mercury switches and mercury manometers in all the pumping plants and a mercury barometer in the IH office of EH&S Department. The only risk of occupational exposures would be if a mercury switch, manometer, or barometer was dropped during a replacement activity. Note that mercury is a liquid metal at room temperature and as such, if the metal is spilled it can "leak" into cracks and crevices where it can continue to present an inhalation hazard for long periods of time.

9.2 Occupational Exposure Limits

9.2.1 OSHA PEL

Exposures to mercury are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1000, Table Z-2. The PEL for mercury is set at 1 mg/10 m^3 (same as 0.1 mg/m^3) and was taken from the 1971 ANSI standard Z37.8-1971.

9.2.2 ACGIH TLV®

The TLV® for elemental mercury was last updated by the ACGIH TLV Committee in 1991. The TLV® is set at 0.025 mg/m^3 (same as 25 µg/m^3) with a Skin notation. There is a Biological Exposure Indices for mercury in urine and in blood (see Section 9.6). **CAP will use the TLV® as our OEL including the Skin notation.**

9.2.3 Other OEL: In 1973 NIOSH published Criteria for a Recommended Standard for Occupational Exposure to Inorganic Mercury (73-11024). In this Criteria Document they recommend an occupational exposure limit of 0.05 mg/m^3 as an 8-hour TWA with a Skin notation.

9.3 Initial Exposure Determination. As stated above, mercury exposures at CAP are unlikely to occur as the mercury capsule in the electronic switches is enclosed in a metal housing. Each pumping plant has a Mercury Spill Cleanup Kit and standard procedure have been developed for cleanup. Exposures would be for very short time periods to cleanup minimal amounts of mercury (estimated at between 5 to 10 cc's). In the event that this should occur, arrangements will be attempted to monitor the cleanup and document exposure levels.

9.4 Methods of Compliance

9.4.1 Discussions have occurred on the possibility of replacing the mercury switches but that is not likely to occur soon. Mercury exposure issues will be addressed using PPE, including respirators, until more exposure data is obtained.

9.5 Respiratory Protection

9.5.1 Respirators will be used during any mercury spill cleanup activities. Respirators will be full-faced air-purifying respirators with a quantitative fit factor of > 1000. Cartridges will be combination P100 and mercury vapor. The North product number for this cartridge is 75852P100L. These cartridges are not stocked in the warehouse. One pair of these cartridges should be kept in each Mercury Spill Cleanup Kit at each of the pumping plants.

9.6 Medical Surveillance

9.6.1 Medical monitoring. Since CAP does not have a special SEG for mercury exposures there is no medical surveillance program in place for mercury. Medical surveillance will be based on accidental exposures occurring during a mercury spill cleanup. In the event of an accidental exposure the exposed employee will report to the closest occupational health clinic and be evaluated based on the treating physician's recommendations.

9.6.2 Biological Monitoring. The ACGIH Biological Exposures Indices (BEI®) provides for two different measurement methods for mercury exposures. Total inorganic mercury in the urine, collected prior to start of shift, has a BEI® of 35 micrograms of creatinine per gram of urine. The second method has a BEI® of 15 µg/L creatinine in blood, collected at the end of a work shift at the end of a work week. BEI® samples may be collected during an accidental exposure episode and results should be compared to the BEI® listed.

10.0 NICKEL EXPOSURES

10.1 Nickel at CAP

Exposures to nickel at CAP are currently limited to the Fab Shop, the Machine Shop, and those locations at the pumping plants that weld with nickel containing rods or wire. Review of Chemical Inventory forms in LiveLink do not indicate nickel containing rod/wire currently (2014) at any of the pumping plants. Welding and machining of nickel containing alloys are the only known exposure sources at CAP.

Personal breathing-zone air monitoring during welding operations using high content nickel welding rods (>25% Ni) have not indicated TWA exposures exceeding any of the OELs currently available. Welding at Headquarters has fixed and portable local exhaust ventilation (LEV) to assist in controlling exposures. Welding work in the pumping plants do not have access to the same local exhaust systems, however, some of the plants have purchased the portable "smoke-eater" type LEV for welding and other particulate control issues. These should always be used during welding operations as the welding fumes generated are very small in size. Welding particles are in the range of 0.1 to 1.5 micrometers in diameter and easily enter the lungs during inhalation, reaching the deepest part of the bronchial tree where the greatest tissue damage occurs.

10.2 Occupational Exposure Limits

10.2.1 OSHA PEL

Exposures to nickel are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1000, Table Z-1. The PEL for nickel is set at 1 mg/m^3 as an 8-hour TWA.

10.2.2 ACGIH TLV®

The TLV® for elemental nickel was last updated by the ACGIH TLV Committee in 1996 and is set at 1.5 mg/m^3 as an inhalable particulate. The Committee has also set a TLV® for nickel, as an insoluble inorganic compound at 0.2 mg/m^3, inhalable. A TLV® of 0.1 mg/m^3 has been set for soluble inorganic nickel, inhalable particulate. The ACGIH does not consider nickel to be a human carcinogen. **CAP will use the TLV® of 0.2 mg/m^3 for insoluble, as well as soluble nickel as our OEL.**

10.2.3 Other OEL

NIOSH considers elemental nickel to be a human carcinogen and publishes a REL of 0.015 mg/m^3 as an 8-hour TWA.

10.3 Initial Exposure Determination

10.3.1 Previous sampling for nickel has been done in the Fab Shop of the Headquarters facility. These sample results indicate that nickel exposures are generally below the OSHA PEL of 1 mg/m^3. However, depending on the materials being welded and the use of local exhaust ventilation, exposures often exceed the CAP OEL of 0.2 mg/m^3.

10.4 Methods of Compliance

10.4.1 Because of the intermittent exposures to nickel controls will rely on local exhaust ventilation (LEV) during welding work. When welding work requires use of rod or wire with a nickel content of greater than 5%, respiratory protection should be considered when the welding location is not suitable for using local exhaust ventilation such as a welding table or a portable LEV system.

10.5 Respiratory Protection

10.5.1 Respiratory protection for nickel will follow the same guides as for any welding fume exposures. Current air monitoring does not indicate a need for respiratory protection except perhaps in confined or enclosed space (for which no air monitoring data is yet available). Welders should consider the use of respiratory protection whenever long periods of welding work are expected (i.e., greater than 4 hours of "stick-time" per workday).

10.6 Medical Surveillance

10.6.1 Medical Monitoring

CAP does not have a special SEG for nickel exposures due to the low exposure measurements and the infrequent exposure periods. There is no medical surveillance program in place for nickel. Medical surveillance will be a component of our Welders SEG. The employee will be referred to our current Occupational Health Clinic for evaluation of metals/welding (nickel) exposure.

10.6.2 Biological Monitoring. Current technology does not allow for accurate assessment of nickel exposures based on collection of biological specimens.

11.0 SILVER EXPOSURES

11.1 Silver at CAP

At present (2014), silver metal is only known to occur in the silver solder used at CAP for soldering work. Of the referenced industrial uses of silver, the only use at CAP would be for soldering and brazing metals or as any alloy of chrome or nickel. There is a wide temperature range between the melting point of silver (1763° F.) and the boiling point (3924° F.). The maximum listed temperature of a propane soldering torch is 3623° F. which is approximately 300°F. below the boiling point and silver fumes are not expected to occur at CAP during soldering operations.

11.2 Occupational Exposure Limits

11.2.1 OSHA PEL

Exposures to silver are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1000, Table Z-1. The PEL for silver metal, as Ag, is set at 0.01 mg/m^3.

11.2.2 ACGIH TLV®

The TLV® for silver metal, dusts, or fume was last updated by the ACGIH TLV Committee in 1992 and is set at 0.1 mg/m^3.

11.2.3 Other OEL

The NIOSH REL for silver metal, dusts, and soluble compounds is set at 0.01 mg/m^3. **CAP will use the REL as our OEL.**

11.3 Initial Exposure Determination (IED)

11.3.1 Silver exposures at CAP would only occur when silver soldering is being conducted and this is very seldom. One working group that could do silver soldering on occasion is Headquarters Maintenance and any of the pumping plants that are doing repairs to soldered joints. Exposures would be for short time periods, estimated at 15 to 45 minutes per day. In the event that this should occur, arrangements will be made to monitor these soldering operations to evaluate negative exposures to silver.

11.4 Methods of Compliance

11.4.1 After determining exposures to silver CAP Environmental, Health, and Safety Department will consider what compliance methods are best suited to workplace exposures. Due to infrequent exposures occurring at a variety of locations it is expected that worker protection will consist of the use of respirators (see below). At Headquarters a portable HEPA filtered local exhaust ventilation unit is available from the Fab Shop and could be used to control exposures to silver solder fumes if the work takes place in an area large enough to allow use of this unit.

11.5 Respiratory Protection

11.5.1 Respiratory requirements will consist of using a half-mask or full-face air-purifying respirator using P100 particulate filters until an IED has been conducted to evaluate airborne exposures to silver.

11.6 Medical Surveillance

11.6.1 Medical Monitoring

CAP does not have a special SEG for silver exposures at this point. Results of the IED will assist in assigning a SEG for silver exposures. The employee will be referred to our current Occupational Health Clinic for evaluation of silver exposures.

11.6.2 Biological Monitoring. There are no BEIs for exposures to silver fumes.

12.0 ZINC EXPOSURES

12.1 Zinc at CAP

At present time exposures to zinc are expected to only occur during welding operation on galvanized steel. Previous air monitoring during welding work on galvanized steel indicated exposures to zinc

oxide were 2.14 mg/m^3 as an 8-hr. TWA. This measurement was for total dust and not as a respirable fraction so it cannot be directly compared to the TLV®. Additional exposure information is needed for zinc oxide.

12.2 Occupational Exposure Limits

12.2.1 OSHA PEL

Exposures to zinc are regulated by OSHA (ADOSH) and can be found at 29 CFR 1910.1000, Table Z-1 as zinc oxide. The PEL for zinc oxide is set at 5 mg/m^3 for the respirable dust fraction (fumes) and 15 mg/m^3 for total dust levels.

12.2.2 ACGIH TLV®

The TLV® for zinc oxide was last updated by the ACGIH TLV Committee in 2001. The current TLV® for zinc oxide is 2 mg/m^3 as a respirable dust. They also recommend a STEL of 10 mg/m^3, also as a respirable fraction. **CAP will use the TLV® as our OEL including the STEL.**

12.2.3 Other OEL

The NIOSH REL for zinc oxide is 5 mg/m^3 with a Ceiling Value of 15 mg/m^3 for dusts and 10 mg/m^3 for fumes.

12.3 Initial Exposure Determination

12.3.1 An Initial Exposure Determination (IED) for zinc oxide indicated that the 8-hr TWA for zinc oxide as 2.14 mg/m^3 as a total dust sample. Additional measurements will be needed to address the respirable dust level for zinc oxide.

12.4 Methods of Compliance

12.4.1 Due to the infrequent exposure periods for zinc no recommendations are made for zinc oxide exposures at this point. The previous sample (collected July 15, 2008 – Survey 2008-05) was the last time galvanized steel was welded in the Fab Shop.

12.5 Respiratory Protection

12.5.1 No recommendations are made at this point for control of zinc oxide exposures.

12.6 Medical Surveillance

12.6.1 Medical Monitoring

CAP does not have a special SEG for zinc oxide exposures due to the low exposure measurements and the infrequent exposure periods. There is no medical surveillance program in place specifically for zinc. Medical surveillance for zinc will be a component of our Welders' SEG. The employee will be referred to our current Occupational Health Clinic for evaluation of metals/welding (zinc) exposure.

12.6.2 Biological Monitoring. There are no BEIs for exposures to zinc oxide dusts or fumes.

13.0 EMPLOYEE INFORMATION AND TRAINING

Before assignment to work areas where exposures to these metals could occur, the worker must be informed of the hazards of the metals and made aware of the means to protect themselves from exposures. This initial awareness training will be provided by the employee's supervisor and should be updated annually. Training should describe what the specific hazards of each exposure type present, the various routes of exposure and the form of the metal when exposures occur (dusts, fumes, etc.), and the various engineering, work practice, and PPE controls available to reduce or eliminate exposures. Information on any air monitoring conducted during the previous 12 months should also be shared with the employees.

13.1 General Awareness Training. All employees at CAP with access to work areas containing any of these metals (as stock materials or as work process debris) will receive general awareness training consisting of the follow:

- Information on the types of hazardous metals found at CAP work areas;
- Awareness of where these metals may be found at CAP and the types of health effects caused by exposures; and
- Common means for protecting against exposures during work activities.

13.2 Specific Authorized Employee Training. All employees at CAP who routinely work with any of these metals will receive specific training on the following:

- The types of hazardous metals found at CAP work areas including quantities, locations, storage, sources of exposures, and specific nature of work operations using the metal;
- The types of work activities that can render these metals to a state where exposures are hazardous to the workers (i.e., welding generates fumes which create a greater risk of exposure than machining which generates metal shavings and dusts, long term storage could lead to oxidation and dusts, etc.);
- Proper use of protective equipment and/or steps to limit or control exposures including purposes, proper use, and limitations of all PPE used;
- Purpose and full description of the specific components of a medical surveillance program for metals exposure and the reasons for each component; and
- Information on what engineering controls and work practices are recommended for each metal as well as any planned engineering controls to be instituted in the future;
- How to protect themselves during work activities which could generate any or all the hazards associated with each metal; and
- Availability of all OSHA substance specific regulations and associated Appendices.

13.3 Signs and Labels

In work areas where abrasive blasting, welding, or metal machining occurs, signs will be posted at the entrance to these areas to indicate that hazardous metals are being worked and hazardous dusts or fumes could be present. The following sign will be posted in a readily visible location:

> DANGER – REGULATED AREA
> Welding and machining produces hazardous fumes, dusts, gases, and radiation. Proper PPE is required when working in this area.
> DO NOT LOOK AT WELDING ARCS. EYE INJURY WILL OCCUR.
> **Some of these metals are known to cause lung cancer.**

13.4 Observation of Monitoring

All activities conducted under this program are open and available to the employees. Those employees who wish to know more about air monitoring activities, calculation of exposure results, historical exposure records, or laboratory analytical procedures are welcomed to access this information through CAP's Senior Industrial Hygienist.

13.5 Appendices in the Occupational Safety and Health Administration Regulations

Several of the OSHA General Industry and Construction Standards for metals contain appendices that require that health hazard information on certain heavy metals is provided to exposed employees. To assist in the availability of this information, CAP is providing the location of these appendices for the informed employee. On the OSHA Website (http://www.osha.gov) you can select "Laws and Regulations" from the "Top Links" section of the home page. Select either the General Industry or the Construction regulations and then scroll down to the appropriate regulation. Health hazard information is usually found in Appendix A and the following standards contain that health hazard data:

General Industry	Construction
1910.1018 – Arsenic	1926.62 – Lead
1910.1025 – Lead	1926.1118 – Arsenic
1910.1027 – Cadmium	1926.1127 – Cadmium

In addition, PDF copies of these appendices are available from the Senior Industrial Hygienist in the Environmental, Health, and Safety Department and can be e-mailed upon request.

14.0 CONTRACTORS

Whenever outside contracted personnel are to be engaged in activities covered by the purpose and scope of this program, the outside contractor must, at a minimum, comply with the requirements of the OSHA Standards for exposures to heavy metals. Additionally, the Bureau of Reclamation Safety and Health Standards (revision 2009) states, in Section 7.1 – Occupational Health, Employee Exposure Standards, that the contractor will "Maintain employee exposures to airborne contaminants at or below the more protective requirements of the OSHA permissible exposure limits (PELs) or the American Conference of Governmental Industrial Hygienists

(ACGIH) Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents". To achieve that goal, the following actions will be taken.

14.1 CAP's responsibilities.

- Notify contractors who may conduct work on CAP properties that certain heavy metals may be found in buildings, structures, and/or equipment and provide specific information on the types and locations of metals, as they relate to the contract work being provided.
- Require adequate documentation that the contractor has met the OSHA requirements for exposure determinations as required by substance specific standards such as arsenic, cadmium, hexavalent chromium, and lead as well as those metals listed in 1910.1000, Tables Z-1 and Z-2 and 1926.55(b).

14.2 Contractor's Responsibilities.

- Ensure that contracted work activities, which could release airborne concentrations of listed heavy metals, do not create exposures to workers which exceed the most stringent of the available occupational exposure limits (see Attachment A).
- For workplace exposures which exceed published OELs, provide appropriate engineering and/or administrative controls to reduce worker exposures to less than the OELs. If selected engineering/administrative controls are not effective, provide appropriate PPE, at no cost to the employee, to achieve breathing zone concentrations which are less than the lowest OELs or the limits specified in the contract.
- When it is unclear as to the proper course of action(s) to reduce or eliminate exposures or if there are questions on the methods of compliance, seek assistance from the Environmental, Health, and Safety Department through the Construction Inspector at the work site.

15.0 PROGRAM REVIEW AND RECORDKEEPING

15.1 Annual Program Review

CAP will review this Heavy Metal Exposure Control Program whenever there is reason to believe that the measures taken under the program may not protect employees. The program will be revised immediately to correct deficiencies found to exist and before subsequent exposures can occur.

This written program will also be reviewed annually to ensure that it is in compliance with the latest updates to the OSHA or ADOSH standards, the latest TLV® by the American Conference of Governmental Industrial Hygienists, and the most current industry standards of practice. Notification of this review will be posted with the Environmental, Health, and Safety Department Manager or their designee.

15.2 Biennial Program Review

Every other year (even numbered years) this Heavy Metal Exposure Control Program, as a whole, will be evaluated for field compliance. This may be CAP's Environmental, Health, and Safety Department, or by CAP's Internal Audit Department, or a qualified outside contractor. A written report of findings will be prepared and a listing of findings will be given to the Senior Industrial Hygienist for review, comment, and implementation.

15.3 Recordkeeping. For compliance with the OSHA/ADOSH regulations, records must be kept in accordance with §29 CFR 1910.1020. This standard requires the following records retention:

15.3.1 Employee Exposure Monitoring Data. Records of employee breathing zone air sampling, as well as any area air monitoring data, will be recorded by the Senior Industrial Hygienists. Appropriate data should be recorded in the Medgate medical surveillance software with hard-copy records stored in electronic format and originals archived for a period of 30 years from the date of exposure monitoring. Employee data recorded will meet the requirements of the recordkeeping sections of the appropriate substance specific OSHA standards.

15.3.2 Medical Surveillance Reports. Medical records relating to workplace exposures are required to be kept for the duration of employment PLUS 30 years. First aid treatment records, health insurance claims records (maintained separate from workplace medical surveillance), and records for employees with less than 1 year of employment are exempted from this requirement (as long as the short-term employee is provided with a copy of any medical surveillance upon termination). All medical surveillance data will meet the requirements of the recordkeeping sections of the appropriate substance specific OSHA standards.

15.3.3 Program Reviews. Field evaluation, annual program review, and biennial program review reports will be kept for a period equal to the existence of this program PLUS 30 years.

15.3.4 Availability of Records. Employee exposure monitoring data and medical surveillance records will be available to employees or employee selected representatives under the same guidance as outlined in the OSHA regulations for recordkeeping, §29 CFR 1910.1020.

ATTACHMENT A

Table of Current Occupational Exposure Limits for Heavy Metals

Table of Current Occupational Exposure Limits for Heavy Metals (2014)

HEAVY METAL	OSHA PEL	ACGIH TLV	NIOSH REL	OTHER	CAPs OEL
Arsenic	0.001 mg/m^3	0.01 mg/m^3	0.002 mg/m^3 C	N/A	OSHA PEL
Cadmium	0.005 mg/m^3	0.002 mg/m^3 R	LFC (0.1 mg/m^3)	N/A	ACGIH TLV®
Chromium Hexavalent, water soluble	0.005 mg/m^3 (5 µg/m^3)	0.05 mg/m^3 (50 µg/m^3)	0.001 mg/m^3 (1 µg/m^3)	N/A	NIOSH REL & 0.05 µg/m^3 AL
Chromium Hexavalent, water insoluble	0.005 mg/m^3	0.01 mg/m^3	0.001 mg/m^3	N/A	N/A
Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3	N/A	ACGIH TLV®
Manganese	5 mg/m^3 C	0.2 mg/m^3	1 mg/m^3	3 mg/m^3 C (NIOSH)	ACGIH TLV®
Mercury	0.1 mg/m^3 C	0.025 mg/m^3 S	0.05 mg/m^3 S	0.1 mg/m^3 C (NIOSH)	ACGIH TLV®
Nickel, insoluble compounds (Ni)	1 mg/m^3	0.2 mg/m^3 I	0.015 mg/m^3	N/A	ACGIH TLV®
Nickel, soluble compounds (Ni)	1 mg/m^3	0.1 mg/m^3 I	0.015 mg/m^3	N/A	ACGIH TLV®
Silver	0.01 mg/m^3	0.1 mg/m^3	0.01 mg/m^3	0.1 mg/m^3 I MAK	OSHA PEL
Zinc oxide	5 mg/m^3 R	2 mg/m^3 R	5 mg/m^3	N/A	ACGIH TLV®

NOTE:

C	=	Ceiling (not to be exceeded during the workday – measured over a 15 minute sample period).
N/A	=	None Available.
LFC	=	Lowest Feasible Concentration possible using currently available engineering and/or administrative controls; based on analytical technology.
AL	=	Action Level – when exposures exceed the AL, engineering controls and respiratory protection must be used.
NIOSH	=	National Institute for Occupational Safety and Health
S	=	Skin Notation meaning the chemical may be absorbed into the body through the unbroken skin.
I	=	Inhalable Particles meaning chemical creates an exposure hazard for any portion of the respiratory tract; generally particle sizes of less than 100 micrometers.
MAK	=	Maximum Allowable Concentration: exposure limits set by the German Republic.
R	=	Respirable Particles meaning chemical creates an exposure hazard primarily in the terminal bronchioles of the lungs; generally particle sizes of less than 10 micrometers mean particle diameter.

ATTACHMENT B

Definitions for Heavy Metals

Exposure Control Program

DEFINITIONS

The following definitions are adapted from Occupational Safety and Health Administration (OSHA) standards with additional definitions from the U.S. Bureau of Reclamation, U.S. E.P.A., and consensus standards such as American National Standards Institute (ANSI) and American Society for Testing and Materials (ASTM).

Action Level means employee exposure, without regard to the use of respirators, to an airborne concentration of approximately one-half of the published Occupational Exposure Limit (OEL), calculated as an 8-hour time-weighted average (TWA). Generally, the Action Level is the exposure at which CAP will take engineering, administrative, or protective equipment actions to control, reduce, or eliminate worker exposures to a contaminant.

As free as practical means at a low level relative to the room or work area being tested. In other words, break room, office spaces, and restrooms should have NO detectable levels of any specific metal. Hand washing and change rooms should have metal concentrations at the lowest detectable level of the analytical method but no more than 20 micrograms of metal dust (except for zinc) per square foot of sampled surface ($\mu g/ft^2$). Dirty change rooms and actual working areas should have levels at or below 100 $\mu g/ft^2$ (except for zinc). While work is actually in progress settled dust levels could exceed 500 $\mu g/ft^2$. However, housekeeping requires that the area be cleaned at the end of the shift and should reduce the dust levels to less than 100 $\mu g/ft^2$. See Attachment D for acceptable levels for each metal.

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Baseline Hazard Assessment mean an evaluation of all the safety and health risks of a specific work activity or operation. This involves not only airborne concentrations of chemical exposures, but also considers any engineering controls in use or available for purchase; any or all personal protective equipment which could be used to reduce risk; and the components of the work activity which can be reassigned, chemically substituted, or replaced with automated techniques. It is a written review which documents all the above features of a single work process and then assigns a risk factor of low, medium, or high for the overall risk to the employee.

Biological Monitoring means sampling and analysis of body fluids for evidence of heavy metals exposures for each employee covered under this written program. This includes such metals as arsenic (u), cadmium (u/b), hexavalent chromium (u), cobalt (u/b), lead (b), and mercury (u/b) [where "u" means urine sample and "b" means blood sample].

Competent person means one who is capable of identifying existing and predictable heavy metal hazards in the work place and who has authorization to take prompt corrective measures to control, reduce, or eliminate workers exposures.

Director means the Director of National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or their designee. It can also mean the Director of the Occupational Safety and Health Administration (OSHA) or the Arizona Division of Occupational Safety and Health (ADOSH), or their designee(s).

Dusts refers to fine, dry, solid particles of metal produced by cutting, drilling, crushing, grinding, screening, loading, etc. Dusts can be ingested by attaching to the skin of the hands, lips, or nostrils or, if small enough in size, can become airborne and inhaled into the lungs.

Elemental metal means the basic form of a metal as a chemical element such as carbon, nitrogen, aluminum, sulfur, iron, etc. For example, elemental lead is pure, 100% lead, as opposed to lead oxide (lead and oxygen) from welding or lead sulfide (lead ore dusts). Thirty-six metals have TLV® guidelines published as exposure limits but only nine are covered by this written program.

Fumes are airborne particles formed when a solid, such as metal, is vaporized (heated to a gaseous state) and then condenses back to a solid again. Fumes are typically rounded or smooth, irregular shaped particles and are generally smaller than 1 micrometer in size. This makes them very easy to inhale deep into the lower limits of the lungs thereby making fumes more hazardous than dusts, when comparing particle types.

Heavy Metals (in this written program) specifically refers to the following metals: arsenic, cadmium, chromium (including elemental chrome and chrome III as well as hexavalent chromium), lead, manganese, mercury, nickel, silver, and zinc (as zinc oxide).

HEPA vacuum means a vacuum cleaner which has been designed with a high-efficiency particulate air (HEPA) filter as the last filtration stage. A HEPA filter is a filter that is capable of capturing particles of 0.3 microns or larger with 99.97% efficiency. The vacuum cleaner must be designed so that all the air drawn into the machine is expelled through the HEPA filter with none of the air leaking past it.

Inhalable particulate means particle sizes, as defined by the ACGIH, to include materials which are hazardous when deposited anywhere in the respiratory tract. Particle sizes for inhalable particulate would include all particles smaller than approximately 100 micrometers (µm) mean diameter. Particles between 100 µm and about 25 µm are massive enough and large enough that most will impact on the mucous lining of the nose, mouth, and upper airway of the respiratory system. Particles smaller than about 25 µm will remain in the airstream and penetrate deeper in the lungs.

Initial Determination means the initial air sampling of a specific work activity to determine the employee's risk of inhaling airborne lead or other metal concentrations while conducting that specific work activity.

Lead means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

Lead-Based Paint means paints or coatings which contain greater than 0.5 percent, by weight (5,000 ppm) lead, when analyzed by an accredited laboratory. This definition comes from the Consumer Product Safety Commission which prohibited the use of lead in commercially available paints in 1978 and defined Lead-Based Paint at that time. Alternately, lead-based paints also means coatings that contain 1.0 milligrams or more of lead per square centimeter of coated surface, as measured by an X-ray fluorescence analyzer (XRF). **NOTE:** "Lead-containing" paints (paints with lead at levels as low as 30 ppm) are also covered under this written program as being a potential source of lead exposure.

Medical Surveillance means the medical examinations or procedures performed by or under the supervision of a licensed physician for the sole purpose of identifying risk when exposed to a defined hazard (such as heavy metals).

Negative Initial Determination (NID) means air samples, collected and analyzed by a statistically reliable measure, that indicate, on a given work task, employee breathing-zone exposures to a heavy metal are less than the Action Level of the metal being evaluated.

NIOSH means the National Institute for Occupational Safety and Health operating under the Center for Disease Control.

Occupational Exposure Limit means the exposure to which nearly all employees may be exposed, 8 to 10 hours per day, 40 hours per week, and might not expect to suffer any adverse health effect. These OELs may be OSHA PELs, ACGIH TLVs®, NIOSH RELs, or other consensus exposure standards or guidelines.

Permissible Exposure Limit (PEL) means the regulated exposure limit, without regard to the use of respirators, to an airborne concentrations of heavy metal, calculated as an 8-hour time-weighted average (TWA), published by OSHA in 29 CFR 1910.1000, Tables Z-1 through Z-3 or in separate standards (such as 29 CFR 1910.1025 for lead). It should be noted that the PELs are not health-based exposure limits.

Positive Initial Determination means air samples, collected and analyzed by a statistically reliable measure, that indicate, on a given work task, employee breathing zone exposures to a heavy metal has exceeded the Action Level for that metal.

Recommended Exposure Limit (REL) means an occupational exposure limit recommended by NIOSH as being protective of worker health and safety over a working lifetime. The REL is used in combination with engineering and work practice controls, exposure and medical monitoring, labeling, posting, worker training, and personal protective equipment. The limit is expressed as a TWA

exposure for up to 10 hr/day during a 40-hour workweek. The REL may also be expressed as a Short-Term Exposure Limit (STEL) that should never be exceeded and is to be determined in a specific sampling time (usually 15 minutes), or a Ceiling Limit that should never be exceeded even instantaneously unless specified over a given time period.

Regulated Area means an area, demarcated by the employer, where an employee's exposure to airborne levels of heavy metal dusts or fumes could, or reasonably be expected to, exceed the Action Level for that metal (or one-half the OEL if no Action Level is specified).

Respirable Particulate means particle sizes, as defined by the ACGIH, to include materials which are hazardous when deposited in the gas-exchange region of the lungs and include smaller sized particles. Particle sizes for respirable particulate would include particles smaller than approximately 10 micrometers (µm) mean diameter. These particle sizes are small enough and light enough in weight to remain suspended in the inhaled air stream down to the deepest part of the lungs and even into the alveoli themselves. As such they are the most hazardous of inhaled particulate matter.

Soluble Compounds means a metal that can react to other chemicals in the body, such as sulfates and phosphates, and becomes dissolved in body fluids such as blood, urine, or other cellular tissues. As a dissolved compound it is able to penetrate any cell in the body. Soluble metals have been reported in the respiratory tract, gastrointestinal system, eyes, kidneys, and blood cell forming parts of the bones.

Threshold Limit Value®(TLV®) means the health-based exposure limit recommendation for an airborne concentration of heavy metal, calculated as an 8-hour time-weighted average (TWA), published by the American Conference of Governmental Industrial Hygienists.

Thoracic Particulate means particle sizes which are as large as approximately 25 micrometers (µm) or smaller in mean diameter. These particle sizes generally settle out of the respiratory tract in the upper and mid-level bronchioles as they are too large in particle diameter and mass to reach the lower airways or the alveoli.

ATTACHMENT C

Procedures for Solvent Removal of Lead-Based Paint

Procedures for Lead-Based Paint
Removal of Less-Than 4 Square Feet

Prior to any lead-based paint removal work, the supervisor should contact the Safety Department to verify a current (less than 12 calendar months) Negative Initial Determination is available for leaded paint removal. Under no circumstances may lead-based paint be ground or wire brushed (wire wheels) from a surface without prior consent, in writing, from the Safety Department. Removal of lead-based paint, less than 4 square feet, is to be conducted only by individuals who have attended the Lead Paint Awareness training (1 hour class time). This Awareness training must be repeated at least every 12 calendar months. These procedures will be evaluated periodically and updated as needed.

Procedures:

1. Place 6 mil polyethylene film (plastic) on the floor or surface below the area where Lead-Based Paint (LBP) is to be removed. The plastic must extend at least two feet beyond any coating to be removed. Secure plastic to floor or surface with vinyl duct tape.
2. Apply the paint stripper to be used on the coating. The preferred stripper is **Hydrostrip 500** from Devoe High Performance Coatings (direct charge item – not stocked in the warehouse).
3. After the necessary contact time, scrape the coating off with a putty knife or equivalent. A small wire brush can be used to reach welding beads and/or corners. If the vapors from the stripper create an odor, respiratory protection should be worn. Use a minimum half-mask air-purifying respirator with combination P100/Organic Vapor cartridges.
4. Apply multiple coats of stripper as needed. Scrapings can be dropped into a plastic bag or onto the 6 mil poly film. Use a second scraper, if needed, to clean the stripper from the putty knife.
5. After removal of the coatings carefully roll up the wet stripped materials in the 6 mil poly and place all bagged waste materials into another plastic bag.
6. Transport the sealed bag(s) to Environmental Waste Building for disposal.

Contact the Safety Department Industrial Hygienist at 623-869-2155 if you have any questions.

ATTACHMENT D

ACCEPTABLE LEVELS FOR

WIPE SAMPLE ANALYSIS

Table of Acceptable Levels
For Wipe Sample Collection and Analysis

Metal	Break Rooms or Clean Rooms	Wash Rooms & "Clean" Work Areas	Adjacent to Blast Booth & in metal working areas
Arsenic	< 0.1 µg/ft^2	< 1 µg/ft^2	< 2 µg/ft^2
Cadmium	< 0.2 µg/ft^2	< 2 µg/ft^2	< 4 µg/ft^2
Chromium (hex)	< 0.5 µg/ft^2	< 5 µg/ft^2	< 10 µg/ft^2
Lead	< 5 µg/ft^2	< 50 µg/ft^2	< 100 µg/ft^2
Manganese	< 20 µg/ft^2	< 100 µg/ft^2	< 400 µg/ft^2
Mercury	< 2.5 µg/ft^2	< 25 µg/ft^2	< 50 µg/ft^2
Nickel	< 10 µg/ft^2	< 100 µg/ft^2	< 200 µg/ft^2
Silver	< 1 µg/ft^2	< 10 µg/ft^2	< 20 µg/ft^2
Zinc (oxide)	< 200 µg/ft^2	< 500 µg/ft^2	< 1000 µg/ft^2

NOTE: < = less than the value listed; "Clean Rooms" are areas where food or drinks could be consumed, including offices and break areas such as designated smoking areas; "Clean Work Areas" are those where metals are not normally handled as part of the work practice, including tool rooms, storage room, and storage areas.

Wipe samples will be collected using standard clean techniques and wiping an area as large as possible but not exceeding 2 square feet. Smaller areas can be wiped but consider that it is harder to reach the detection limit of the method when collecting smaller sample sizes.

ATTACHMENT E

Work Practices for Disassembly of Lead Coated Equipment

This procedure is to be used for any disassembly of valve, flanges, dresser couplings, and other pumping plant equipment that is under repair. Most repair activities will use abrasive blasting to remove the lead based paint (LBP) prior to the actual repair work. Occasionally some disassembly has to occur prior to blasting to protect components from pitting or other damage from the abrasive. A copy of this procedure should be posted at or adjacent to the work area.

1. **PROHIBITED ACTIVITIES:**

   a. Wire wheels or abrasive grinding pads MUST NOT be used at any time during disassembly work.

   b. Compressed air must not to be used to clear debris during disassembly work and clean-up activities.

   c. Dry sweeping, shoveling, or other dry clean-up of dust and debris MUST NOT be conducted during disassembly work or clean-up activities.

2. **REQUIRED ACTIVITIES.** The following actions should be adhered to during disassembly work on lead coated surfaces.

   a. Vacuum cleaners equipped with HEPA filters will be used to collect all debris and dust containing materials disturbed from the equipment surface. **DO NOT USE COMPRESSED AIR!**

   b. Place a sheet of 6-mil polyethylene (poly) on the floor in the area where the disassembly is to take place. Poly should extend a minimum of 10 feet in all directions around any equipment surface that will be impacted by the disassembly

   c. Barricade the area of the poly to indicate a regulated area and restrict entry to only those employees involved in the disassembly.

   d. Employees within the regulated area should wear disposable shoe covers during the period of time they are inside the barricades. Prior to leaving the regulated area they should remove the shoe covers to prevent the possibility of "track-out" of lead dusts

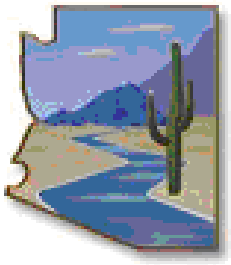
   e. After completing all necessary disassembly, remove the equipment and support stands from the poly. Have personnel outside the regulated area remove the barricades. Remove the shoe covers and step outside the poly

   f. Carefully fold over the outer edges of the poly allowing any accumulated debris to fall slowly toward the center of the poly. This must be done slowly and with care. Some of the dusts will be very fine and working too fast will suspend the dusts into the air. After completing a couple of folds in the poly, carefully roll the folded poly into a cylinder, allowing the air to expel very slowly. Once the air is removed, the tube of poly can be folded in half or quarters and taped shut with vinyl duct tape and submitted to Environmental for proper disposal

Contact the Safety Department Industrial Hygienist at 623-869-2155 if you have any questions.

CENTRAL ARIZONA PROJECT

SAFETY AND HEALTH DEPARTMENT



LEAD IN CONSTRUCTION PROGRAM

NOVEMBER 8, 2005

CENTRAL ARIZONA PROJECT
LEAD IN CONSTRUCTION PROGRAM

1.0 GENERAL REQUIREMENTS

The Central Arizona Water Conservation District (CAWCD) Lead in Construction Program is established to protect CAWCD employees from exposures to lead. The program establishes requirements for practices and procedures for the work processes referenced in Attachment A, Paragraph 3.0.

This written program and related training program was prepared in accordance with 29 CFR 1926.62, the Federal Occupational Safety and Health Administration (OSHA) Final Rule for Lead Exposure in Construction. CAWCD management reserves the right, at its discretion, to modify, revise, or amend this program in any manner appropriate to protect human health and the environment.

2.0 SCOPE

The CAWCD Lead in Construction Program is applicable to all employees of the CAWCD. Work processes covered in this program include, but are not limited to routine and emergency maintenance of equipment, overshoots, buildings, cranes, tanks, and other structures with lead based coatings.

3.0 COMPLIANCE

Compliance with this program is mandatory. Willful disregard for this program or any of its provisions may result in corrective action as outlined in the CAWCD Policy on Corrective Action found in the Employment Section of the Policy Handbook.

4.0 DEFINITIONS

Definitions specific to the Lead in Construction Program are as follows:

Action Level – The employee exposure, without regard to the use of respirators, to an airborne lead concentration of 30 micrograms per cubic meter of air (30 $\mu g/M^3$) calculated as an 8-hour time weighted average (TWA).

Competent Person- A person who is capable of identifying existing and predictable lead hazards and has authority to take corrective measures to eliminate them, up to and including cessation of work by employees.

Lead- Metallic lead, all inorganic lead compounds, all organic lead soaps.

Lead Activity Permit/Checklist – A document that is signed by both the competent person and the Safety and Health Department prior to lead work activities commence. It is used to ensure that all lead hazards associated with the project have been addressed.

Permissible Exposure Limit (PEL) – The employer is required to assure that no employee is exposed to lead at concentrations greater than 50 micrograms per cubic meter of air ($\mu g/M^3$) averaged over an eight hour period.

If the employee is exposed to lead for more than 8 hours during a work shift, the employee's PEL will be reduced according to the following formula:

Adjusted PEL ($\mu g/M^3$) = 400 divided by hours worked in the day.

NOTE: When respiratory protection is used to limit employee exposure and all of the requirements relating to the selection, fitting, and maintenance of respirators taking into consideration the airborne concentration of lead or condition of use are met, employee exposure may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn.

5.0 RESPONSIBILITIES

The Safety Manager or his designee is responsible for the overall program administration and has authority to initiate necessary changes to ensure program efficiency. The Safety Manager is also responsible for the initial employee training.

The Senior Industrial Hygienist is responsible for the exposure assessment portion of this program and medical portion of this program.

All CAWCD personnel are responsible for achieving full compliance with this program.

When an outside contractor is retained for work that falls under the provisions of 29 CFR 1926.62, the outside contractor will have and comply with its own Lead in Construction Program, which will be submitted to the Safety and Health Department for approval prior to the commencement of work for approval.

6.0 EXPOSURE ASSESSMENT

The Senior Industrial Hygienist will initially determine if any employee may be exposed to lead at or above the Action Level for a workplace or work process covered by this program. A portion of the initial determination may include paint chip analysis. For example, a CAWCD coating sampling program was designed to assess the percentage of lead present in existing paint in addition to employee initial monitoring.

Based on the initial monitoring results, periodic industrial hygiene monitoring may be necessary. Initial industrial hygiene monitoring will consist of personal breathing zone samples representative of a full work shift, including at least one sample for each job classification in each work area for the shift with the highest potential exposure level.

CAWCD is required to notify each employee in writing of the results of personal monitoring.

7.0 WRITTEN COMPLIANCE PROGRAM

The CAWCD Written Compliance Program is a written strategy and schedule that must be implemented prior to the commencement of lead work. The Written Compliance Program and Lead Work Activity Permit/Checklist must be kept on the work site and must be reviewed and updated at least annually by a designated Competent Person.

8.0 RESPIRATORY PROTECTION

Respirators must be used in accordance with CAWCD Respiratory Protection Program. Employees will select the appropriate respirator from the Lead Work Activity Permit/ Checklist located in Attachment A, Paragraph 8.0.

9.0 PROTECTIVE WORK CLOTHING

The supervisor or his designee will provide or arrange for protective work clothing and equipment to employees whose job includes processes referenced in Attachment A, Paragraph 8.0. The proper use and disposal requirements for protective clothing and equipment are included in the CAWCD Written Compliance Program in Attachment A.

10.0 HOUSEKEEPING AND HYGIENE PRACTICES

10.1 Housekeeping: All surfaces which employees may come into contact with must be maintained as free as practicable of accumulations of lead. This is to be accomplished by vacuuming floors, rafters, and other surfaces with a High Efficiency Particulate Air (HEPA) vacuum which is rated 99.7% efficient in filtering 0.3 micron sized particles. Shoveling, dry or wet sweeping, and brushing may be used only when HEPA vacuuming or other similar methods have been tried and found to be ineffective.

Blowing with compressed air to clean up floors or other surfaces where lead accumulates is prohibited.

10.2 Hygiene Practices: Food, beverages, tobacco products, and cosmetics are prohibited within the area of lead processes referenced in Attachment A.

10.3 Hygiene Facilities: Clean change areas, hand washing facilities, and eating areas will be provided for employees whose job duties include Lead Work Activities for the work processes covered in Attachment A.

10.4 Showers: Shower facilities must be provided for employees whose job duties include Lead Work Activities for the work processes referenced in Attachment A, Paragraph 3.0. Where showers are provided, employees must shower at the end of the work shift. Where showers are not provided, employees must wash their face and hands at the end of the workshift and proceed to the nearest pumping plant to shower.

11.0 MEDICAL SURVEILLANCE

The Safety and Health Department will coordinate the medical requirements of this program including medical surveillance, medical removal protection, and medical evaluation to wear a respirator. Initial medical surveillance consisting of a blood lead

level and zinc protoporphyrin levels will be provided to employees occupationally exposed to lead at or above the airborne Action Level of 30 µg/M^3.

Periodic medical surveillance will be provided to employees exposed at or above the action level for more than 30 days in any consecutive 12 month period. This surveillance will consist of a blood lead and zinc protoporphyrin level test every 2 months for the first 6 months of exposure, then every 6 months thereafter for the duration of lead exposure. If any blood lead results exceed 40 micrograms lead per deciliter of whole blood (µg/dl), the blood testing will continue until 2 consecutive results are below 40 µg/dl. Testing will resume at 6 month intervals.

If an employee is exposed to lead levels greater than the Action Level for more than 30 days per 12 month period or if a blood lead level exceeds 40 µg/dl, a full medical examination will be provided annually. Medical examinations will also be provided upon notification of the employee to the Safety and Health Department that he or she has developed signs or symptoms associated with lead intoxication. Respiratory protection physicals will be provided prior to fit testing of the respirator or if the employee has a demonstrated difficulty breathing during fit testing or during use of the respirator.

The medical examination will include a detailed work and medical history, physical examination, and laboratory testing in accordance with OSHA regulations, 29 CFR 1926.62(j)(3)(ii).

The Safety and Health Department will provide the examining physician with appropriate forms specifying the physical examination's content, a copy of the OSHA regulation 29 CFR 1926.62, a description of the affected employee's duties related to lead exposure, the employee airborne lead exposure level or anticipated lead exposure level, a description of the personal protective equipment, prior lead exposure levels, and any prior physician written opinions. The written medical opinion sent to the employee will include notification that the employee has the right to seek a second medical opinion.

The employee has fifteen days from the date of receipt of notification to advise the Safety and Health Department that he or she intends to seek a second opinion or has scheduled such an appointment. The multiple physician review process will be administered by the Safety and Health Department.

Employees will be notified of the standard requirements for medical removal protection when the blood lead level exceeds 50 µg/dl.

12.0 EMPLOYEE INFORMATION AND TRAINING

Employees who work in areas where airborne levels of lead may be at or above the Action Level on any day, regardless of respirator use, are provided with a training program at the following times:

1. Prior to initial assignment.
2. Annual training, unless further exposure at or above the Action Level will not occur on any given day.

Training will be coordinated and approved by the Safety Manager.

13.0 RECORDKEEPING

The Lead in Construction Program records will be maintained as follows:

1. Records of exposure assessments and objective data relied on to determine initial exposure will be maintained by the Safety and Health Department. Records will be maintained according to OSHA's regulations.
2. The CAWCD Training Form is used to certify employee training and retraining and is retained in the supervisor's office. A copy of the training record must be attached to the Written Compliance Program.
3. The Safety and Health Department will maintain records pertaining to medical surveillance and medical removals.

14.0 SIGNS

A warning sign must be posted at the entrance of each Lead Work Activities area for the work processes referenced in the CAWCD Written Compliance Program in Attachment A, Paragraph 3.0. The sign must be posted and maintained in a manner which assures that the legend is readily visible. The sign must read:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

15.0 OUTSIDE CONTRACTORS

When outside contractors are retained for work that applies to 29 CFR 1926.62, the CAWCD Safety and Health Department:

1. Informs the contractor to have and comply with its own Lead Compliance Program, which meets the requirements of 29 CFR 1926.62.
2. Informs the contractor of the elements, including the hazards identified and the CAWCD experience with the workplace.
3. Informs the contractor of any precautions or procedures CAWCD has implemented for the protection of employees in or near the workplace where the contractor personnel will be working.
4. Coordinates with the contractor, when both CAWCD personnel and contractor employees will be working, so employees of both CAWCD and the contractor comply with the requirements of 29 CFR 1926.62.

5. Briefs the contractor of known hazards confronted during the work activity.

ATTACHMENT A

WRITTEN COMPLIANCE PROGRAM

ATTACHMENT A
WRITTEN COMPLIANCE PROGRAM

A copy of this program with the attached Lead Work Activity Permit/Checklist must be present at the job site. Any changes to this program must be agreed to by the competent person and the Safety and Health Department Manager or designee.

1.0 Purpose
The program is designed to protect Central Arizona Water Conservation District (CAWCD) employees from occupational exposure to airborne lead during maintenance operations. This compliance plan was prepared in accordance with 29 CFR 1926.62, the Occupational Safety and Health Administration Lead in Construction Standard.

2.0 Coverage
CAWCD employees whose job responsibilities are included in the Lead Work Activity Permit for the work processes referenced in the Hazard Assessment section below are covered under this program.

3.0 Hazard Assessment
An initial assessment of paint samples indicates a high variability of lead present for different sample locations throughout CAWCD. Initial personal industrial hygiene air monitoring results indicate that employees may be exposed to lead, without respect to respiratory protection, above the PEL during burning, cutting, abrasive blasting, sanding, surface preparation and welding operations where the structure is coated with lead based paint. Based on the initial assessment, this compliance plan applies to maintenance activities on CAWCD structures and equipment such as (but not limited to) abrasive blasting, welding, brazing, or other activities where the lead based coating is disturbed.

Lead is a metal present in certain paint pigments, corrosion resistant metal for fasteners and may be present in some base metals. Lead fumes may be generated when base metal or surfaces with lead-based coatings are heated to temperatures required during burning, cutting, and welding operations. Lead containing dust may be generated during grinding, sanding, and buffing surfaces with lead based coatings.

4.0 Compliance Program
This program must be implemented prior to the commencement of any job covered under this program.

A copy of the CAWCD lead in Construction Program including this Compliance Program will be maintained at the work site while the maintenance work is being performed. If necessary, this program will be revised to reflect changes in practices and procedures.

5.0 Competent Person

The Competent Person is capable of identifying existing and predictable lead hazards and has authority to take corrective measures to eliminate them, up to and including cessation of work by employees. The job supervisor or other designee will be the Competent Person. The competent person must be capable of identifying existing and predictable lead hazards and has authorization to take corrective measures to eliminate them. The Safety and Health Department will be responsible for specifying the level of training necessary for the Competent Person based on the lead hazards present.

The competent person will fill out the Lead Work Activity Permit and review all aspects of the Compliance Program with affected employees at each job site before work begins. The Lead Work Activity Permit will be filled out for each job site and will be attached to this compliance program.

6.0 Engineering Controls

Engineering controls and alternative personal protective equipment will be evaluated from a safety, health and environmental impact. Currently, personal protective equipment, administrative controls, and good personal hygiene will be used to control for lead exposure.

If possible, lead-based coatings will be removed from the surface areas to be repaired before burning, cutting, or welding is performed. Any required burning on coated or painted surfaces must be kept to a minimum.

7.0 Administration Controls

Employees who are not required to be in the lead work area are prohibited from being in the area of any Lead Work Activities listed in the Lead Work Permit.

8.0 Personal Protective Equipment(PPE)

The equipment requirements listed on the Lead Work Activity Permit/Checklist are in addition to normal PPE that would be required for the given task.

Respiratory Protection Requirements

Employees required to use a respirator to perform their work must be medically approved to wear a respirator by the CAWCD Safety and Health Department and comply with the CAWCD Respiratory Protection Program. If a tight fitting respirator is worn, the employee is required to be fit-tested in compliance with OSHA requirements. All respirator users must be instructed in the respirators use, care, and limitations.

Personal Protective Clothing Requirements

Employees working in the activities listed in the Lead Work Activity Permit will wear fully-encapsulating disposable coveralls (with head and foot coverings). Vinyl duct tape will be used to seal the cuff of the sleeve around the glove.

Employees will be provided with work uniforms. CAWCD will launder the uniforms provided employees in a manner consistent with OSHA guidelines.

9.0 Housekeeping and Personal Hygiene

Food, beverages, tobacco products, and cosmetics are prohibited within 100 feet of any Lead work Activity. All surfaces that employees come in contact with must be maintained as free as practicable of accumulations of lead. This is accomplished by vacuuming floors, rafters, and other surfaces with a HEPA vacuum. Shoveling, dry or wet sweeping, and brushing may be used only where HEPA vacuuming or other equally effective methods have been unsuccessful.

Employees leaving the lead work activity will move into a decontamination area. This decontamination area will consist of a tarp to catch loose debris from the personal protective equipment. Workers performing lead work activities will remove surface dust from their protective clothing with a HEPA vacuum before leaving the decontamination area. Employees will wash their hands and face with pre-moistened hand wipes before leaving the decontamination area.

All contaminated clothing, HEPA filters, personal hygiene material, and respirator cleaning material will be placed in an approved waste disposal drum set up in the decontamination area. The Competent Person will be responsible for leaving the work site environmentally safe. Drum disposal will be coordinated by the Environmental Compliance Administrator.

Contaminated equipment and machinery must be cleaned prior to reuse. The competent person periodically will test vehicles used to transport employees who are involved in lead work activities to ensure that contamination is not present in the vehicles. Vehicles involved with lead work activities will be cleaned using a HEPA vacuum on at least a weekly basis until the lead work is completed. The QuickCheck Lead Test Kits will be used per manufacturer's instructions to perform check for lead build up in the vehicles. Results will be documented on the Lead Activity Permit/Checklist

10.0 Warning Signs

A warning sign must be posted on all entrances leading to a lead work area. The sign must be posted and maintained in a manner which assures that the legend is readily visible.

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

11.0 Personal Air Monitoring

Based on the initial air monitoring results, periodic industrial hygiene monitoring may be necessary. Air monitoring will be conducted on a representative number of workers during burning, cutting, welding, and other operations in the lead work area to evaluate lead exposure. Each employee monitored will receive his or her results in writing after the exposure assessment. Contact the Safety and Health Department Industrial Hygienist to schedule personal air monitoring.

12.0 Employee Training

All employees covered under this program will be provided with a training program regarding all components of 29 CFR 1926. Training components will include:

1. Potential health effects of lead exposure
2. Industrial hygiene monitoring
3. Potential lead work activities
4. Standard operating procedures and this Written Compliance Plan
5. Engineering and administrative controls
6. Medical surveillance and access to records.
7. Contents of the OSHA Standard and Appendices (29 CFR 1926.62)
8. Purpose, selection, fitting, use, and limitations of respiratory protection.

Training will be provided by the Safety and Health Department. Annual refresher training is required.

13.0 Medical Surveillance

The Safety and Health Department will administrate the medical requirements of the program including medical surveillance, medical removal protection, and medical evaluation to wear a respirator.

14.0 Outside Contractors

Outside contractors will coordinate lead work activities with the CAWCD Safety and Health Department prior to commencing work in an activity covered by this program.

ATTACHMENT B

LEAD WORK ACTIVITY PERMIT AND CHECKLIST

CENTRAL ARIZONA PROJECT
LEAD WORK ACTIVITY PERMIT AND CHECKLIST

All copies of the permit must remain at the job site until the work is completed.
Return form to Safety and Health Department upon completion of Lead Work.

GENERAL INFORMATION:

Location of Work: _____

Description of Work: _____

Anticipated Duration of Project: (Dates): _____ to _____

Designated Competent Person (Name and ID# required): _____

Work Order Number: _____

Authorized Employees:

_____ _____

_____ _____

_____ _____

HAZARD ASSESSMENT:

MMS Item Number: _____

Lead Swab Positive? _____

Lead Chip Sample: _____ PPM

RESPIRATOR SELECTION:

ACTIVITES:

Class A:

Approved Respiratory Protection

Full-face Supplied Air Respirator with blasting attachments

- ❑ Abrasive blasting
- ❑ Other Activity:_____

Class B:

Approved Respiratory Protection

Full-face Air-Purifying Respirator with P-100 or R-100 cartridges OR Class A work respirator (above).

- ❑ Welding
- ❑ Cutting
- ❑ Grinding
- ❑ Assisting Class A activities
- ❑ Other Activity: _____

Class C:

Approved Respiratory Protection

Half-face Air-Purifying Respirator with P-100 or R-100 cartridges OR Class B work respirator (above).

- ❑ Scrapping
- ❑ Welder Helper
- ❑ General Cleanup
- ❑ Assisting class B activities
- ❑ Other Activity: _____

ENGINEERING CONTROLS:

- ❑ HEPA Vacuum (required)
- ❑ Local Exhaust Ventilation/type:_____
- ❑ Alternative Engineering Control (describe):_____

_____

ADMINISTRATIVE CONTROLS

- ❑ Decontamination area (required)
- ❑ Warning Signs (required**)**

WORK PRACTICE/SANITATION (required)

- ❑ Shower
- ❑ Contaminated clothing/equipment container(s)
- ❑ Tarps/plastic for decontamination station
- ❑ 3- 5 gallon buckets, brushes, and towels
- ❑ Hand Sanitizer/Towlettes
- ❑ Labels for drums
- ❑ Folding table
- ❑ Lead test kit

PERSONAL PROTECTIVE EQUIPMENT

- ❑ Disposable Coveralls, (flame retardant type if hot work)
- ❑ Worker clothing/laundering arrangements made (required)
- ❑ Duct tape
- ❑ Respiratory protection as specified above

CENTRAL ARIZONA PROJECT
LEAD WORK ACTIVITY PERMIT AND CHECKLIST (page 2)

All copies of the permit must remain at the job site until the work is completed.

❑ **SPECIAL PRECAUTIONS:**

❑ **OTHER INSTRUCTIONS (ADDITIONAL PPE, ETC.):**

VEHICLE LEAD CHECKS (License Plate, Number of Tests, Number of Positive Results):

DECONTAMINATION PROCEDURES:

1. While wearing respiratory protection, HEPA vacuum all surfaces of outer garments and equipment.
2. Rinse boots, if necessary, use brush to remove debris. Remove boots
3. Remove outer coveralls and dispose of in plastic drum.
4. HEPA vacuum inner work garment
5. Remove respiratory protective equipment, discard cartridges into drum. If end of shift rinse respirator and place into 5 gallon bucket w/ cleaning solution. Clean respirator and leave to air dry overnight in a clean area.
6. Wash hands, then face, with soap and water
7. At end of shift, return to nearest CAWCD facility with shower. Shower and change into street clothes.

SIGNATURES/DATE:

Competent Person

Safety and Health Department

LOWER SANTA CRUZ RECHARGE BASINS
ACCESS PROCEDURES

For the safety and protection of Central Arizona Project (CAP) employees working in and around the Lower Santa Cruz Recharge Basins (LSCR) the following procedures have been established.

These procedures are to be followed by all CAP employees requiring access to the LSCR:

A. All CAP employees are to always use the "APPROVED ACCESS ROUTE" to the LSCR (shooting range and recharge basin) by using the Sanders Road entrance north of the BKW Farms office. (Shown in red on map attached.) Signs have been placed on the access road warning not to enter the area when the flag is flying. Furthermore, if the Shooting Range is closed to all users, a barricade with a sign saying, "NO SHOOTING - RANGE CLOSED" will be located at the actual entrance to the shooting range. (Note: BKW Farms office is located at 11600 N. Sanders Road, Marana, AZ. Ph. 520-682-2516.)

CAP Scheduled Work:

B. All CAP "Scheduled Work" is coordinated with BKW Farms at least 72 hours in advance, via email, and placed on the shoot@bkwfarms.com calendar. During CAP scheduled work, the entire shooting range is closed to other users. (All users are scheduled on the shoot@bkwfarms.com calendar.) A large barricade with a sign that says: "NO SHOOTING - RANGE CLOSED" will be placed by CAP personnel in the middle of the entrance to the shooting range. (This barricade sign is locked on a pole directly next to the shooting pit entrance with a CAP lock and BKW Farms lock. See map attached.) CAP employees must: 1.) Unlock the sign from the pole; 2.) Place the sign in the center of the entrance to the shooting range; 3.) Lower the flag, place the flag in the box, and clip the tag over the flag as a method of securing the flag; 4.) Advise the CAP Control Center at Ext. 2530 that they will be working in the LSCR; 5.) After work is completed CAP employees must remove the tag from around the flag, remove and lock-up the barricade sign to the fence, and call the CAP Control Center advising that the LSCR is vacated.

CAP Un-scheduled Work:

C. If un-scheduled, urgent access is required, phone contact and email contact by the CAP Supervisor to BKW Farms must occur so that arrangements can be made to ensure the entire shooting range is closed to other users. All closure procedures mentioned in paragraph B. above apply.

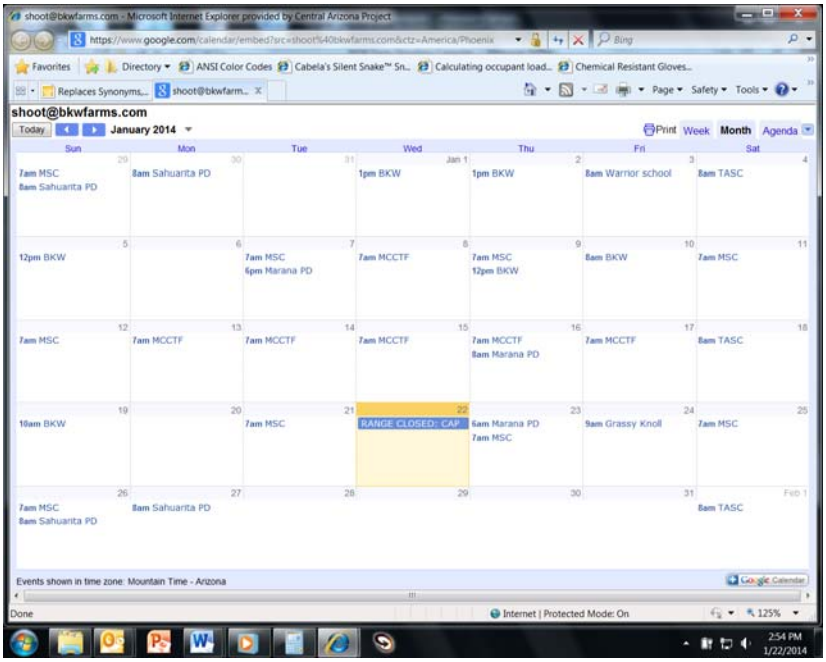
D. All CAP employees are restricted from entering the route to the LSCR unless the entire shooting range is closed to other users and all closure procedures are in place.

If you are in agreement with page one and two of this document, sign, date and return it to Darin Perkins, CAP Environmental, Health & Safety Manager at the earliest convenience.

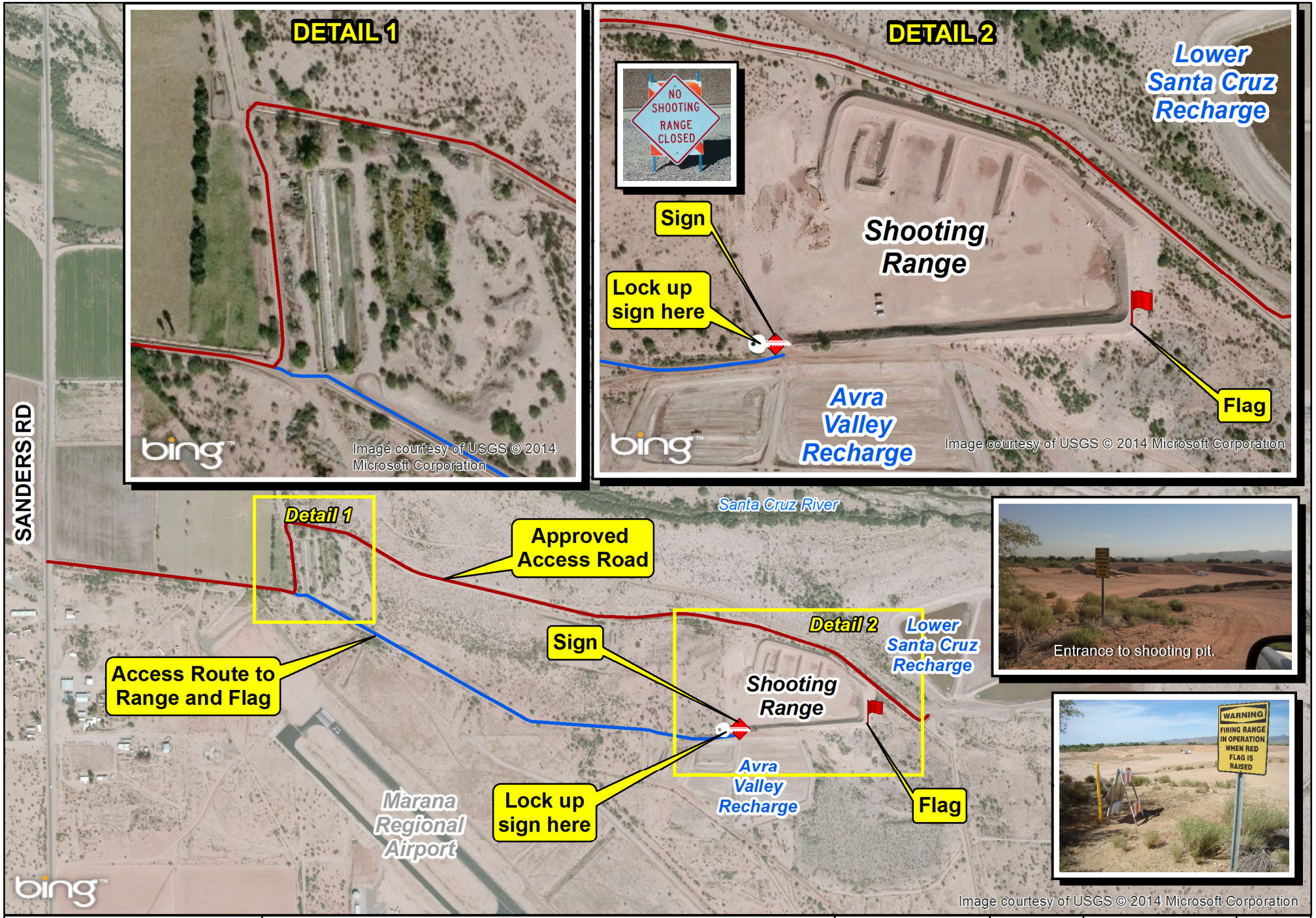
I am in agreement with the terms as stated in this document.

Brian Wong			**520-631-3639**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
George Garcia			**602-292-1952**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
Guy Rodriguez			**520-982-2202**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
David Sanchez			**602-526-1778**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
Tim Gorey			**602-292-5676**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
Perri Benemelis			**480-262-1827**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
Joe Gaylord			**480-251-6103**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
John Hussen			**602-300-8360**
PRINT	SIGNATURE	DATE	CONTACT NUMBER
Darin Perkins			**623-302-2776**
PRINT	SIGNATURE	DATE	CONTACT NUMBER

P.O. Box 43020 – Phoenix, AZ 85080-3020
23636 North Seventh Street – Phoenix, AZ 85024
623-869-2333



https://www.google.com/calendar/embed?src=shoot%40bkwfarms.com&ctz=America/Phoenix



CAP LOWER SANTA CRUZ RECHARGE

LEGEND

- Flag
- Sign
- Lock up sign here
- Access Route to Range and Flag
- Approved Access Route

SCALE

0 500 1,000

Feet

N W E S

Date: APRIL 2014

Location: X:\Maps\CAP_Facility\Canal_Facilities

Projection: NAD 83, HARN, AZ State Plane, Central Zone, Intl. Feet

Source:

CAP CENTRAL ARIZONA PROJECT

CENTRAL ARIZONA PROJECT

MACHINE GUARDING PROGRAM

JANUARY 1, 2020

1.0 PURPOSE

The purpose of the Machine Guarding program is to ensure the safety of CAP employees that install, repair and operate machinery during the course of their work. The program is designed to make sure employees understand that accidental contact with the point of operation of machinery can cause injury to an operator or others. Employees are responsible for learning to control and eliminate these hazards.

2.0 SCOPE

The program applies to managers, supervisors, and employees that are involved in purchasing, installing, repairing, operating and working around machinery, from fixed equipment to portable and hand-held tools. Machinery falling within the scope of OSHA standards 29 CFR 1910.211 to 1910.241 is covered by the program.

3.0 PROGRAM COMPONENTS

3.1 Application: When there are questions about how a particular tool or machine fits into the program or what type of guarding and administrative controls should be applied, supervisors and EH&S start by reviewing the appropriate standards and the manufacturer's literature to determine appropriate guarding requirements.

3.2 Roles and Responsibilities: CAP departments, managers, supervisors, and employees that plan, supervise, install, repair, and operate tools and machinery have specific roles and responsibilities in the Machine Guarding program. The EH&S Department is involved in the machine guarding process from the time the machine is requested for purchasing approval to the time the machine is installed, guarded and authorized for use. Maintaining consistency throughout all CAP facilities is a primary goal.

3.3 Training: The purpose of CAP's online Machine Guarding Training and Familiarity Training is to ensure that all employees that operate or work around machinery know that any machine point of operation may cause injury and must be safeguarded. OSHA places responsibility on employers to ensure all personnel who utilize machinery know how and why safeguards are used. Machine guarding training also becomes an integral part of the competency of the professional machinist or operator and provides important controls to counter the daily risks of machine operations.

3.4 Program Maintenance: Any time a new machine (other than hand-held) is purchased, it must go through a purchasing, inspection, PM development, and documentation process before the machine is placed into operation.

4.0 RESPONSIBILITIES

4.1 **The EH&S Department** is responsible for:

- Managing and maintaining the consistency of CAP's Machine Guarding Program in all facilities and revising the program as appropriate.
- Assisting departments with selection of proper machine guards or alternative protective measures from the automatic purchasing workflow process to installation, machine commissioning, and training.
- Involvement to ensure all guards and electronic components are of the same quality, UL approved, are consistently applied throughout all CAP facilities, and installed by "competently trained" personnel.
- Inspecting machinery for appropriate guarding, reporting any hazardous conditions to the appropriate department, including placing a machine out of service.
- Investigating injuries related to machine operation.
- Oversight and follow-up for machine-specific training and familiarity training every three years.
- Oversight and maintenance of safety placards, yellow document holders, and all documentation stored inside the machine guarding notebooks.

4.2 **Departments that operate machinery** are responsible for:

- Ensuring all machines are properly inspected and guarded.
- Corrective action with employees who violate the program requirements.
- Ensuring that employees recognize mechanical and electrical hazards.
- Conducting and supporting on-line and familiarity training.
- Maintenance of safety placards, yellow document holders, and all documentation stored inside the machine guarding notebooks.

4.3 **Managers and Supervisors** are responsible for:

- Ensuring an operator is safe, competent and proficient in the operation of a machine through training and mentoring their abilities to a proficient and productive level.
- Ensuring safe shop practices are followed for personnel outside of the supervisor's organization.
- Ensuring when unsafe acts are noted, they are corrected and do not reoccur.
- Placing a machine out-of-service if the machine is not operating properly, or has damaged or missing parts, guards, or electrical equipment.
- Ensuring that unguarded machines are removed from service until all necessary guards are in place or, if appropriate, a Guard Removal Form is filled out.
- Contacting the Health and Safety Department for an evaluation of safeguards

when concerns regarding adequate protection cannot be resolved.
- Ensuring any vendor-provided training is documented and entered into the CLC.
- Maintenance of safety placards, yellow document holders, and all documentation stored inside the machine guarding notebooks.
- Ensuring personnel do not operate machinery while under the influence of drugs, alcohol, or medication that could affect their ability to operate the machine safely.

4.4 Employees are responsible for:

- Complying with this program, and all applicable federal, state, and local regulations regarding machine guarding.
- Visually inspecting, prior to each use, each tool and machine to ensure all necessary guards are in place.
- Performing 60-day Preventative Maintenance (PM) inspections as specified in this Program.
- Maintenance of safety placards, yellow document holders, and all documentation stored inside the machine guarding notebooks.
- Placing a machine or powered hand tool out-of-service if it is not operating properly, has damaged or missing parts, guards, electrical equipment, or any other protective measures damaged or missing.
- Ensuring loose-fitting clothing, hair, jewelry, or other items that could become entangled in machinery are not worn.
- Wearing appropriate PPE in accordance with signs and JSAs associated with each machine.
- Ensuring machinery is not operated while under the influence of drugs, alcohol, or medication that could affect their ability to operate the machine safely.

5.0 PROGRAM EVALUATIONS

Formalized Machine Guarding Risk Assessments will be conducted by CAP's EH&S department every five years for the purpose of collaborating with operators to determine if improvements can be made relevant to their tasks and hazards and to verify guarding remains adequate. The Risk Assessment process ensures machines:

- Are guarded safely and correctly;
- Are compliant with applicable standards;
- Remain productive after the guarding is installed;
- Follow the same Risk Assessment approach for newly purchased machines.

6.0 TRANING AND ADMINISTRATIVE CONTROLS

The program uses electronic workflows and preventative maintenance software to ensure machinery is evaluated before purchase, after installation, and after authorization for use occurs. Resources installed at each machine provide preventative maintenance tracking and resources to facilitate the operator's before use inspection and the identification and control of the hazards associated with each machine.

- **Machine Purchase Workflow:** Developed into five easy steps that involve the supervisor, planner, buyer, and the EH&S department in the purchasing process for a new machine.

- **Safety Placard:** Promotes awareness with each machine's specific hazards and controls related to things like correct clamping, guarding during operation, and "point of operation" hazards. It also addresses PPE recommendations, housekeeping issues, and reminds operators to check for any damaged parts or tools, and the location of their controls and e-stops, before operating a machine.

- **Yellow Document Holder and notebook** includes: 1.) 60-Day PM Inspection; 2.) JSA; 3.) Parts List; 4.) Lock-out/Tag-out requirements; 5.) Manufacturer's Operations and Maintenance Manual.

- **Guard Removal Approval Form:** Established for the authorization of operating a machine without a guard for a specific task. The removal of a machine guard will require additional steps to be followed, including training for temporary work practices to ensure employee safety.

- **On-line Machine Guarding Training** is sent to the below Maintenance Reliability and Control (MRC) organizations by the Learning Management System (LMS) Administrator.

- **Machine Guarding Familiarity Workflow** training is required when new machinery is purchased or a new employee is hired or transferred to a different organization. The workflow is designed to track the employee through the familiarity training process and acquire the electronic signatures of the supervisor and employees when the training has been completed.

#510	**#621**	**#631**	**#632**	**#633**	**#634**	
#533	**#720**	**#721**	**#723**	**#821**	**#831**	**#836**

PERSONAL PROTECTION EQUIPMENT PROGRAM

CENTRAL ARIZONA PROJECT
ENVIRONMENTAL, HEALTH & SAFETY DEPARTMENT

NOVEMBER 18, 2003

TABLE OF CONTENTS

1.0 INTRODUCTION

The Central Arizona Water Conservation District (CAWCD) Personal Protective Equipment Program (PPEP) covers the use of Personal Protective Equipment (PPE) by CAWCD employees.

2.0 GENERAL REQUIREMENTS

2.1 COMPLIANCE STANDARDS

This program and its training component were prepared in accordance with OSHA 29 CFR 1910.132 thru 29 CFR 1910.139, the PPE for General Industry Regulations and the CAWCD Safety Resource Manual.

2.2 PROGRAM COMPLIANCE

Compliance with instructions and procedures contained in the PPEP is mandatory. Willful disregard for this program or any of its provisions may result in corrective action as outlined in the CAWCD Policy on Corrective Action found in the Employment Section of the Policy Handbook.

3.0 APPLICABILITY

The PPEP is applicable to all employees of the CAWCD. Subjects covered by the PPEP are listed below and in the following sequence:

1. Eye and face protection.
2. Respiratory protection.
3. Head protection.
4. Foot protection.
5. Hand and skin protection.
6. Electrical protective equipment.
7. Training.
8. Contractors.

NOTE: This Program requires that PPE be provided, used, and maintained in a sanitary and reliable condition whenever its use is required.

4.0 PROTECTIVE EQUIPMENT

PPE includes protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers and will be provided by CAWCD. Employees who use PPE are required to maintain their equipment in a sanitary and reliable condition.

Maintenance to PPE is necessary to prevent injury or impairment in function to any part of the body through absorption, inhalation or physical contact from the following:

- Hazards from system processes or the workplace environment.
- Chemical hazards.
- Radiological hazards.
- Mechanical irritants encountered.
- Electrical hazards.

NOTE: Defective and damaged PPE shall not be used and must be replaced.

5.0 SELECTION AND APPROVAL

Existing PPE available at CAWCD was selected based on accepted national and regulatory standards at the time PPE was implemented. All PPE must be approved by the Safety and Health Department prior to use.

NOTE: Section 5.0 of this Program does not apply to respiratory protection, which is covered by the CAWCD Respirator Program.

Hazard assessments conducted by the Safety and Health Department will be used to determine if hazards are present in a CAWCD workplace. PPE must be sufficient to meet accepted standards for protection of employees from the hazards identified.

The following procedure will be used for approval of new or substitute PPE items. Approval must be given prior to use by CAWCD employees. The Safety Manager is responsible for approval of all PPE.

1. The department manager requesting the new or substitute item will provide the following information to the Safety Manager:

   - Name, address, phone number of manufacturer.
   - Technical literature, i.e., flammability, permeability, etc.
   - Models and types available.
   - Contact person for information.

- Intended use, i.e., what procedure requires the product, what is the element requiring protection (Corrosive, acid, heat, cold, etc.).
- Number of employees anticipated to use product, their craft, and location(s).

The Safety Manager will then use the information to determine whether the item(s) meets the following criteria prior to approval:

a. The product meets all applicable standards for the intended use.

b. The product reflects an improvement in increased protection or design (if it is to replace an existing product).

c. The product cost-to-benefit analysis is used to determine if the product will be stock or will be available only through special purchase.

2. The selection decisions will be communicated to each employee through their department manager.

5.1 EMPLOYEE USE OF APPROVED PPE

Each affected employee must use the type of PPE that will protect him/her from the hazards identified in the hazard assessment and or Job Safety Analysis (JSA). Each affected employee must be provided PPE that fits properly.

5.2 EMPLOYEE-OWNED EQUIPMENT

If an employee decides to purchase his/her own PPE it must be approved prior to use. The employee's manager is responsible to assure that it adequately complies with the PPEP, applicable laws and regulations. This includes proper maintenance and sanitation of such equipment.

NOTE: CAWCD does not require or recommend the use of employee-owned PPE.

6.0 HAZARD ASSESSMENT

The following information is intended to assist in implementing requirements for hazard assessment.

In controlling hazards, PPE devices alone should not be relied upon to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound work practices.

It is necessary to consider certain general guidelines for assessing the foot, head, eye and face, and hand hazard situations that exist in CAWCD facilities, and to match the protective devices to the particular hazard.

In assessing the need for PPE, the following steps must be followed:

6.1 ASSESSMENT GUIDELINES

6.1.1 SURVEY

A walk-through survey of the workplace must be made to identify sources of hazards to workers. Consideration should be given to the basic hazard categories: electrical shock, impact, penetration, compression (rollover), chemical, heat, harmful dust and light (optical) radiation.

6.1.2 HAZARD SOURCES

During the walkthrough survey, observe:

1. Sources of motion - Machinery or processes where any movement of machinery or machine elements could exist. (This should include movement of personnel that could result in collision with stationary objects.)

2. Sources of high temperature - High temperatures that could result in burns, eye injury or ignition of protective equipment.

3. Types of chemical exposure.

4. Sources of harmful dust.

5. Sources of light radiation - welding, brazing, cutting, furnaces, heat treatment, high intensity lights, etc.)

6. Sources of falling objects - or potential for dropping objects.

7. Sources of sharp objects - which might pierce the feet or cut the hands.

8. Sources of rolling or pinching objects - which could crush the feet.

9. Layout of workplace - and location of co-workers.

10. Any electrical hazard.

6.1.3 ORGANIZE DATA

Following the walk-through, organize the data and information for use in the assessment of the hazards. The objective is to prepare for an analysis of the hazards in the environment to enable proper selection of protective equipment.

6.1.4 ANALYZE DATA

Following the collection and organizing of the data, make an estimate of the potential for injury. Review each basic hazard determining the type, level of risk, and seriousness of potential injury from each of the hazards found. Consideration should be made where there is an exposure to several hazards simultaneously.

7.0 SELECTION GUIDELINES

Following the workplace assessment, the Safety and Health Department will provide guidance for the selection of protective equipment. This selection will be made based on the following:

1. Potential hazard(s).
2. Type of protective equipment available.
3. What protective equipment will do (i.e., splash protection, impact protection, etc.).
4. Comparison of the hazard(s) to the protective equipment available.
5. Ensure a level of protection greater than the minimum required to protect employees from the hazard(s).
6. Change out times for chemical protective equipment according to permeability data.

7.1 REASSESSMENT OF HAZARDS

The responsible department manager should reassess the workplace hazards as necessary. The Safety and Health Department will assist in identifying and evaluating new equipment and processes. The Safety and Health Department will review accident records, and re-evaluate the suitability of previously selected PPE (refer to section 5.0 of the PPE Program).

8.0 EYE AND FACE

Employees must use the appropriate eye or face protection when exposed to hazards from:

- Flying particles
- Molten metal
- Accumulated dusts
- Liquid chemicals
- Acid or caustic liquids
- Chemical gases or vapors
- Potential injurious light radiation

8.1 SIDE PROTECTION

When there is a hazard from flying objects, each employee must wear eye protection that provides side protection. Detachable side protection (clip-on or slide-on side shields) may be used, provided they meet the requirements of sub-section 6.5 of this program.

8.2 PRESCRIPTION EYE WEAR

Employees who wear prescription lenses while engaged in operations that involve eye hazards must wear eye protection that:

1. Incorporates the prescription in its design or

2. Can be worn over prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

8.3 MANUFACTURER IDENTIFICATION

Eye and face PPE must be distinctly marked to identify the product manufacturer.

8.4 LIGHT RADIATION PROTECTION

Those employees working in an environment requiring protection from injurious light radiation must use equipment with filtered lenses that have a shade number appropriate for the work being performed.

NOTE: Appendix "C" of this Program is a listing of appropriate shade numbers for various operations.

8.5 APPROVAL OF EYE AND FACE PROTECTIVE DEVICES

CAWCD provides for partial payment of prescriptive eye glasses. Protective eye and face protection devices purchased must comply with American National Standards

Institute (ANSI) Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection."

9.0 RESPIRATORY PROTECTION

Respiratory protection is provided for the control of those occupational diseases caused by breathing air contaminated with harmful:

- Dust
- Fog
- Fumes
- Mists
- Gases
- Smokes
- Sprays
- Vapors

The primary objective in the control of occupational disease caused by breathing contaminated air is to prevent atmospheric contamination. This is accomplished by accepted engineering control measures such as:

- Enclosure or confinement of the operation
- General and local ventilation
- Substitution of less toxic materials

When effective engineering controls are not feasible or while they are being instituted, appropriate respirators must be used per the following requirements:

1. Respirators will be provided when necessary to protect the health of employees.

2. Respirators provided will be applicable and suitable for the intended purpose.

3. Employees must use the provided respiratory protection in accordance with instructions and training received.

NOTE: Compliance with these requirements is accomplished through the "CAWCD Respiratory Protection Program".

10.0 HEAD PROTECTION

Employees must wear protective helmets (hard hats) when working in areas where there is a potential for injury to the head from falling objects. On construction sites on CAWCD facilities and property hard hats must be worn at all times.

10.1 ELECTRICAL SHOCK PROTECTION

Employees must wear protective helmets designed to reduce electrical shock hazard when near exposed electrical conductors that could contact the head.

10.2 APPROVAL OF PROTECTIVE HELMETS

CAWCD provides hard hats for all employees. Protective helmets must comply with American National Standards Institute: Z89.1-1986, "American National Standard for Personal Protection Protective Headwear for Industrial Workers Requirements" and the CAWCD Safety Resource Manual

11.0 FOOT PROTECTION

Employees must wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, objects piercing the sole, and where employees' feet are exposed to electrical hazard.

11.1 APPROVAL OF FOOT PROTECTION

CAWCD provides for a reimbursement of up to $200.00 dollars for approved footwear.

The CAWCD Safety Shoe Program and Guidelines details the requirements for purchasing and wearing of approved foot protection.

Protective footwear purchased must comply with American National Standard Institute: Z41-1991, "American National Standard for Personal Protection -Protective Footwear."

12.0 ELECTRICAL PROTECTIVE EQUIPMENT

Employees working in areas where there are potential electrical hazards must use electrical protective equipment that protects the specific parts of the body to be exposed by the work being performed. For further explanations and guidelines refer to the CAWCD Electrical Safety Program.

13.0 HAND AND SKIN PROTECTION

13.1 HAND PROTECTION REQUIREMENTS

Employees are required to use appropriate hand protection when their hands are exposed to hazards such as:

- Cuts or lacerations
- Abrasions
- Punctures
- Chemical burns
- Thermal burns
- Harmful temperature extremes
- Absorption of chemicals

13.2 HAND PROTECTION SELECTION

Selection of the appropriate hand protection is based on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards or potential hazards identified.

13.3 SKIN PROTECTION SELECTION

Selection of the appropriate skin protection, where there is a potential for absorption of a chemical through the skin, must include the permeability of the material to the chemical.

14.0 FITTING OF PPE

The PPE must be properly fitted and the user given instructions on care and use of the PPE.
Protective devices are generally available in a variety of sizes. Care should be taken to ensure the right size is selected. Adjustments should be made on an individual basis for a comfortable fit that will maintain the protective device in the proper position. When manufacturer instructions are available, they should be followed carefully.

NOTE: The user must be aware of all warning labels for, and limitations of, their PPE.

15.0 CLEANING AND MAINTENANCE OF PPE

Each employee shall inspect, clean, and maintain PPE at regular intervals so that the PPE provides the required protection.
Contaminated PPE, which can not be decontaminated, must be disposed of in a manner that protects employees from exposure to hazards. Contact the Environmental Compliance Department (ECD) for proper disposal.

16.0 TRAINING

The department manager and supervisor are responsible to ensure their employees receive appropriate safety training for the duties they perform. Employees who are required to use PPE must receive training that meets the following requirements:

1. Reasons for training.
2. Understanding of training.
3. Retraining.
4. Training records.

16.1 REASONS FOR TRAINING

Training of employees for PPE requirements will be provided by the Safety and Health Department. Each employee must be trained to know the following:

- When PPE is necessary
- What PPE is necessary
- How to properly don, doff, adjust, and wear PPE
- The limitations of the PPE
- The proper care, maintenance, useful life, and disposal of the PPE

16.2 UNDERSTANDING OF TRAINING

Employees must know how to use PPE properly before performing work that requires the use of PPE. Each employee must attend a training session consisting of the following:

- An overview of the reasons for proper use of PPE.
- Other support media that reinforces PPE for head, eye/face, hand and foot.
- Questions and answers session on PPE.

16.3 RETRAINING

Employees who have already been trained must be retrained if:

1. Changes in the work assignment occur that require the use of different PPE.
2. Changes in the work place occur which require additional or different PPE.
3. New PPE is required by statute and/or company rules.
4. Observation of the trained employee indicates a lack of knowledge regarding the proper use, care, and maintenance of the PPE.

16.4 TRAINING RECORDS

The certification of employee training and retraining is accomplished by completing a Training Retention Sheet # 250/9-98). The sheet is forwarded to the CAWCD Safety Trainer and the HR Training Coordinator for entry and record retention.

NOTE: Section 16.0 of this program does not apply to Respiratory Protection, (Section 7.0) and Electrical Protective Equipment (section 10.0.) Specific training is required for these respective programs.

17.0 OUTSIDE CONTRACTORS

Whenever contractors are engaged in activities covered by this program, they must comply with the **"Minimum Safety Requirements**" of the applicable standards or this program whichever is more stringent.

It is the responsibility of the CAWCD Civil Engineering department and CAWCD designated representative that oversees the contractor's activities to ensure compliance with this program.

APPENDIX "A"- FILTER LENS TABLE

Filter Lenses for Protection Against Radiant Energy

Operations	Electrode 1/32 In.	Arc Current	Minimum* Protection Shade
Shielded metal arc welding	Less than 3…… 3-5…… 5-8…… More than 8……	Less than 60…… 60-160…… 160-250…… 250-550……	7 8 10 11
Gas metal arc welding and flux cored arc welding		Less than 60…… 60-160…… 160-250…… 250-550……	7 10 10 10
Gas Tungsten arc welding		Less than 50…… 50-150…… 150-500……	8 8 10
Air carbon Arc cutting	(Light)…… (Heavy)……	Less than 500…… 500-1000……	10 11
Plasma arc welding		Less than 20…… 20-100…… 100-400…… 400-800……	6 8 10 11
Plasma arc cutting	(Light)**…… (Medium)**…… (Heavy)**……	Less than 300…… 300-400…… 400-800……	8 9 10
Torch brazing Torch soldering Carbon arc welding			3 2 14

Filter Lenses for Protection Against Radiant Energy

Operations	Plate thickness --in	Plate thickness --mm	Minimum* Protection Shade
Gas Welding:			
Light	Under 1/8……	Under 3.2……	4
Medium	1/8 to ½……	3.2 to 12.7……	5
Heavy	Over ½……	Over 12.7……	6
Oxygen cutting:			
Light	Under 1……	Under 25……	3
Medium	1 to 6……	25 to 150……	4
Heavy	Over 6……	Over 150……	5

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade that gives sufficient view of the weld zone without going below the minimum. In oxy fuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the work piece.

REFERENCE

MINIMUM PROTECTION STANDARDS

1. Safety Glasses / Side Shields (ANSI 287.1-1989)
2. Face Shield (clear) (ANSI 287.1-1989 [Secondary Protection])
3. Face Shield (shaded) (ANSI 287.1-1989 [Secondary Protection])
4. Face Shield (wire mesh) (ANSI 287.1-1989 [Secondary Protection])
5. Face Shield (UV Flash) (ANSI 287.1-1989 [Secondary Protection])
6. Dust Goggles (ANSI 287.1-1989)
7. Splash Goggles (ANSI 287.1-1989)
8. Welders Goggles (ANSI 287.1-1989/29CFR1910.133 [a] [5])
9. Welding Hood (ANSI 287.1-1989 [Secondary Protection] 129CFR 1910.133[a][5])
10. Sand Blasting Hood (ANSI 287.1-1989 [Secondary Protection])
11. Spray Painting Hood (ANSI 287.1-1989 [Secondary Protection])
12. Hard Hat (ANSI 289.1-1989 [Class °B"])
13. Steel-toed lace-up Safety Boots (ANSI Z41-1991) (49CFR 214.115)
14. Metatarsal Guard steel-toed lace-up Safety Boots (ANSI Z41-1991) (49CFR 214.115)
15. Rubber Boots (steel-toed) (ANSI Z41-1991)
16. Voltage Rated (rubber gloves) (ASTM D120-94a) (ASTM F696-91).

CENTRAL ARIZONA PROJECT

RESPIRATORY PROTECTION PROGRAM

REVISED OCTOBER 1, 2019

1.0 PURPOSE

The purpose of this document is to specify procedures for Central Arizona Project (CAP) employees in the wearing and use of respiratory protection. The CAP Respiratory Protection Program (RPP) applies to all employees, identified through a Baseline Hazard Assessment, who work in the presence of airborne inhalable hazards. Engineering controls, such as ventilation and substitution of less toxic materials, will be the first choice of controls at CAP; however, engineering controls have not always been feasible for some of CAP's operations, or have not always completely controlled the identified hazards. In those situations, respirators and other protective equipment must be used. The program is also meant to ensure compliance with the Occupational Safety and Health Administration standard for Respiratory Protection, §29 CFR 1910.134.

2.0 SCOPE

CAP employees are assigned to the respiratory protection program as a result of Baseline Hazard Assessments conducted by the Senior Industrial Hygienist for the Environmental, Health and Safety (EH&S) Department. These assessments evaluate the types of work activities performed by the employee's job classification, regardless of the location of work assignment. Air sampling results are used to determine the type(s) of respirators required to ensure that worker's exposures to inhalation hazards are kept below those levels recognized to present a health risk to workers. Copies of air sampling assessments are available for review by any personnel likely to have similar exposure risks. Contact the Senior Industrial Hygienist in the EH&S Department to arrange for a review of those documents.

Employees who are not identified as having inhalation risks during their work activities may request a Baseline Hazard Assessment by the EH&S Department. If results of the Baseline Hazard Assessment indicate that airborne hazards do not exceed Occupational Exposure Limits considered to be hazardous, the employee may still choose to wear a respirator. To do so, the employee must read and sign a copy of Attachment A of this program (required by OSHA 1910.134). Additionally, the employee will be instructed in the use of a filtering facepiece (see Section 5.4). Voluntary use of a cartridge air-purifying respirator will be required to be in full compliance with the requirements of this written program.

Outside contractors or vendors who are required to work in areas where recognized airborne hazards may exist must have a written respiratory protection program in compliance with OSHA 1910.134. Their written program must be reviewed and approved by the EH&S Department prior to conducting work on CAP property. The EH&S Department will provide any available information on hazard types and expected airborne concentrations to assist the contractor/vendor in assigning appropriate respiratory protection for their employees.

3.0 RESPIRATOR SELECTION AND USE

3.1 Baseline Hazard Assessment: CAP's Industrial Hygiene Program requires that work operations conducted at various work sites be evaluated to determine the risk to which employees are potentially exposed. When there is potential for inhalation hazards an initial respiratory protection is assigned based on the results of the Baseline Hazard

Assessment. After assignment of respiratory protection, the work activity will be monitored to quantify the airborne concentration of the hazard, assess the risk to the worker(s) conducting the work, and affirm or change the assigned respirator.

Baseline Hazard Assessments have identified several chemicals and job classifications that could create inhalation exposures during work operations. These job classes and associated chemicals (or chemical classes) are identified in Appendix B, along with an "assigned respirator" to ensure adequate protection against the chemical exposure.

Job classifications currently assigned to CAP's RPP include:

- Fab Shop mechanics;
- Apprentice mechanics;
- EH&S Department personnel;
- Protective Coatings personnel;
- Environmental Compliance personnel;
- Heavy Overhaul Group mechanics and supervisors;
- All asbestos trained workers:
- Other employees dependent on job tasks.

3.2 **Respirator Assignments**: Current respirator use at CAP is limited to two types:

Air-purifying respirators

- Disposable filtering facepieces, NIOSH rated as P100 filtration for particulate materials;
- Elastomeric half-face cartridge respirators; and
- Elastomeric full-face cartridge respirators.
  The elastomeric cartridge respirators can be fitted with one of two different types of cartridges which are effective for all inhalation hazards found at CAP.
  - North organic vapor-acid gas-P100 unit that is yellow and magenta in color (part No. 8010-0012).
  - a single North P100 unit (part No. 8010-0053) that is magenta in color. This cartridge DOES NOT filter gases or vapors.

Supplied Air Respirators

- These are only utilized for abrasive blasting and spray coatings applications by the Protective Coatings Crew.

All inhalation hazards identified at CAP can be effectively reduced to non-hazardous levels through the proper use of respiratory protection with the above listed respirators and cartridges.

3.3 **Respirator Use Procedures**: If a new task, not previously identified, is undertaken that may require respiratory protection, the manager or supervisor must contact the EH&S Department in advance to have a Baseline Hazard Assessment completed to determine the respiratory requirements for that work task.

All respirators used at CAP must be certified by the National Institute for Occupational Safety and Health (NIOSH) and will be used in accordance with the terms of that certification. All cartridges and canisters must be labeled with the appropriate NIOSH approval label. The label must not be removed or defaced while it is in use. All employees wearing respiratory protection described in this written program must complete the following, in the order listed:

- If the respirator use is voluntary, they must read and sign Attachment A of this written program and participate in a training exercise to learn the pros and cons of voluntary respirator use;
- All employees, other than voluntary users, must complete and pass a medical evaluation by an authorized occupational health provider;
- All employees, other than voluntary users, must complete an approved training course on respiratory usage, as outlined in Section 8.0 of this program; and
- All employees, other than voluntary users, must successfully complete a quantitative fit test.

3.4 **Voluntary Respirator Usage**: The EH&S Department will support voluntary use of respiratory protective equipment as requested by employees on a case-by-case basis, depending on specific workplace conditions. Employees who wish to voluntarily use filtering facepieces must submit through their supervisor a written request to do so (see page 1 of Attachment A). Voluntary respirator usage is only permitted when the particulate material in question DOES NOT present a recognized inhalation hazard. This means that the particulate has been determined to be a nuisance dust or nuisance particulates, not otherwise considered a respiratory hazard.

Employees voluntarily using these filtering facepieces, will be provided the following [at no cost and during company (paid) time]:

- An opportunity to read and understand the text of Appendix D of the OSHA regulations on respiratory protection, included in this written program as Attachment A; and
- A training session covering the advantages and disadvantages of use and the limitations of filtering facepieces in protecting against airborne particles.

3.5 **General Use Procedures:** Employees will use their respirators under conditions specified by this written program, and in accordance with the training they receive on the use of each particular respirator type and model. In addition, the respirator will not be used in a manner for which it is not certified by NIOSH or by its manufacturer. All employees will conduct user seal checks each time that they wear their respirator.

Employees are not permitted to wear tight-fitting respirators if they have any condition that will prevent them from achieving a good seal. Additionally, any employee with a beard, moustache, or sideburns that are large enough to contact the respirator-to-face seal or the inhalation or exhalation valves will not be allowed to wear a respirator.

CAP will provide employees who require vision correction with special optical sets for their respirators. These glasses will be provided by CAP at no cost to the employee. Frames are available through Material Control and lenses are purchased through outside vendors.

3.6 Supplied Air Respirators: CAP's only use of respirators with Grade D supplied air is by the Protective Coatings Group. These employees conduct abrasive blasting work and spray coatings applications within confined spaces. Supplied air respirators are for use ONLY IN NON-IDLH atmospheres.

It should also be noted here that hose lengths for supplied air respirators must be 300 feet or less from source to respirator AND the maximum inlet pressure must be 125 psi or less.

3.6.1 Breathing Air Quality: Only Grade D breathing air, as defined by ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989 (or most recent specification) will be used for supplied air respirators.

A log of all filter maintenance, calibration of sensors, and testing of the breathing air quality is to be maintained.

3.7 Respirator Maintenance: Respirators are to be properly maintained at all times. Maintenance involves a thorough visual inspection for cleanliness and defects. Worn or deteriorated parts must be replaced prior to use. No components will be replaced or repairs made beyond those recommended by the manufacturer.

The following checklist will be used when inspecting respirators:

- Face piece: Cracks or holes in face mask, distortion, tears, cracked or loose lenses/face shield
- Head straps: breaks or tears, broken or bent buckles
- Valves: residue or dirt, cracks or tears in valve material
- Filters/Cartridges: approval designation, gaskets, cracks or dents in housing, proper cartridge for hazard, cracks or tears in the rubber O-rings
- Air Supply Systems: breathing air quality/grade, condition of supply hoses, hose connections, settings on regulators and valves
- Elastomeric parts: Pliability and signs of deterioration

3.7.1 Cartridge Change-Out Schedule: Based on historical industrial hygiene sampling data and observation of work practices a Change-Out Schedule has been adopted which will provide adequate protection for all standard work operations at CAP. Special non-routine work activities will need to contact the Senior Industrial Hygienist for cartridge life expectancy during these work practices. See Attachment C for CAP's Change-Out Schedule.

3.7.2 Cleaning and Disinfecting: Respirators are to be regularly cleaned and disinfected. Respirators issued for the exclusive use of an employee will be

cleaned as often as necessary, but not less than once per shift when used. Atmosphere supplying and emergency use respirators are to be cleaned and disinfected after each use.

The following procedure is to be used when cleaning and disinfecting respirators:

- Disassemble respirator, removing any filters, canisters, or cartridges.
- Wash the face piece and associated parts in a mild detergent with warm water. Do not use organic solvents such as Stoddard solvent, VM&P Naphtha, paint thinner, xylene, etc.
- Rinse completely in clean warm water.
- Wipe the respirator with disinfectant wipes to kill germs.
- Air dry in a clean area.
- Reassemble the respirator and replace any defective parts.
- Place in a clean, dry, sealable plastic bag or other air tight container.

3.7.3 Respirator Storage: Respirators must be stored in a clean, dry area, and in accordance with the manufacturer's recommendations. Each employee will clean and inspect their own air-purifying respirator and will store their respirator in a sealable plastic bag. Each employee will have his/her name on the bag and that bag will only be used to store that employee's respirator.

4.0 RESPONSIBILITIES

4.1 EH&S Department, Industrial Hygiene Section: The Program Administrator for CAP's Written Respiratory Protection Program is the EH&S Manager/Senior Industrial Hygienist or their designee. The Program Administrator is responsible for implementing and administering the respiratory protection program. Duties of the Program Administrator include:

- Conducting the Baseline Hazard Assessment to identify work areas, processes, or work activities that could require workers to wear respirators;
- Recommending appropriate respiratory protection options;
- Monitoring respirator use and storage;
- Ensuring that respiratory protection training is conducted;
- Ensuring completion of annual fit testing;
- Administering the medical evaluation program;
- Maintaining all records required by this program;
- Evaluating the program on at least an annual basis.

4.2 CLD Department: The Centralized Learning and Development Department is responsible to ensure appropriate training programs are available for employee access; to maintain records on who has received training, dates of training, and training content; and to notify employees when refresher training is due.

4.3 **Managers and Supervisors**: Managers and supervisors are responsible for ensuring that the respiratory protection program is implemented in their areas of responsibility. In addition to being knowledgeable about the program requirements, managers and supervisors must also ensure that the program is understood and followed by the employees under their charge. Duties of the managers and supervisor include:

- Ensuring that employees under their supervision (including new hires) have received a respiratory protection medical evaluation, appropriate respirator training, and fit testing before wearing a respirator;
- Ensuring the availability of appropriate respirators and accessories;
- Coordinating with the Program Administrator on how to address respiratory hazards or other concerns regarding this program.

4.4 **Engineering and Planning Departments**: Purchases of operating equipment must consider chemical emissions as a feature of the purchase agreement. Limits must be placed on the airborne concentrations of chemicals being emitted by new or replacement equipment. Specifics on chemical control technologies can be obtained through the Industrial Hygiene Section and other consultation services.

4.5 **Employees**: Each employee has the responsibility to wear his or her respirator when and where required and in the manner in which they were trained. Employees must also:

- Care for and maintain their respirators as instructed, and store them in a clean sanitary location in a sealable plastic bag;
- Inform their supervisor if the respirator no longer fits well and request a new one that fits properly; and
- Inform their supervisor or the Program Administrator of any respiratory hazards that they feel are not adequately addressed in the workplace and of any other concerns that they have regarding this program.

5.0 MEDICAL EVALUATIONS FOR RESPIRATORY PROTECTION

Employees enrolled in the Respiratory Protection Program must be medically evaluated to ensure that respirator wearing will not place the employee at additional risk. All employees who are required to wear respirators must meet acceptability of the medical evaluation. These are conducted annually for all respirator wearers performing asbestos related work and every two years for non-asbestos respirator wearers.

6.0 EMPLOYEE INFORMATION AND TRAINING

The EH&S Department will provide training to respirator users and their supervisors on the contents of the CAP Written Respiratory Protection Program and their responsibilities under it. Employees will be trained prior to using a respirator in the workplace. Supervisors will also be trained prior to assigning respirator usage in the workplace or prior to supervising employees that must wear respirators. The training course will cover the following topics:

- Why the respirator is necessary and how improper use, storage, fit, or maintenance can compromise the protective effect of the respirator.
- Abilities and limitations of respirators used at CAP.
- How to use the respirator correctly, including emergency/malfunction procedures.
- How to inspect, don/doff, and check the seals of the respirator.
- Cleaning and maintenance procedures.
- How to recognize medical signs and symptoms that may limit respirator effectiveness.
- Requirements of the OSHA Respiratory Standard, 29 CFR1910.134, and CAP's Written Respiratory Protection Program.

Employees will be retrained annually or more often if needed (e.g., if they change departments and need to use a different respirator type). Respirator training will be documented by the EH&S and CLD Departments.

7.0 QUANTITATIVE FIT TESTING

CAP employees who are required to wear a respirator must be fit tested prior to working in areas of potential inhalation hazards. Employees will be fit tested annually at a minimum, and may be fit tested more frequently if evaluation of the program, changes in the workplace, employee requests, or observation of respirator usage during program evaluations indicate a need for more frequent fit testing. Fit testing will be conducted by personnel from the EH&S Department who have been trained on the operation and use of the quantitative fit testing system.

The fit testing will be completed for each respirator type that the employee is assigned or has selected to wear, including half-face and full-face types, as well as the filtering facepieces.

8.0 PROGRAM EVALUATIONS

The Program Administrator will conduct periodic (at least annual) evaluations of the workplace to ensure that the provisions of this program are being implemented. These evaluations will include documented consultations with employees who use respirators and their supervisors, site inspections, air monitoring results, and a review of records. Problems identified will be noted on an inspection log and addressed by the Program Administrator. These findings will be reported to CAP management, the report will suggest plans to correct deficiencies in the respirator program, and list target dates for the implementation of those corrections.

9.0 RECORDKEEPING

This Respiratory Protection Program is stored electronically in Content Server and can be accessed through the Safety Resource Center. The OSHA Respiratory Protection Standard, 29 CFR 1910.134, is maintained on the OSHA web-site at *http:/www.osha.gov*.

Records of calibration and testing of breathing air systems will be submitted to the EH&S Department within 15 working days of the date the service was performed. These forms will

be reviewed and stored by the Program Administrator for a period of not less than 30 years from the date of service.

The medical qualification records for all employees covered under the respirator program are also maintained by the EH&S Department. All medical records related to respiratory protection will be retained for 30 years. Fit test records will be kept for at least 2 years or more and will be deleted when test date is more than 3 years old.

Annual program evaluations completed by the EH&S Department Program Administrator, as well as internal or external audits of the written respirator program, will be retained by the Program Administrator. They will be retained for a period of not less than 30 years from the evaluation date.

Appendix A

Voluntary Enrollment in the
CAP Respiratory Protection Program
(OSHA Appendix D)

(Please photocopy this form and submit copy to EH&S)
REQUEST FOR VOLUNTARY RESPIRATOR USE

Name: _____ Employee ID # _____ Work Group _____

Supervisor: _____ Signature: _____

I formally request voluntary use of a filtering facepiece respirator for use at CAP for the following reason(s):

_____

_____

_____

_____

Medical reason for request: ☐ Yes ☐ No

Today's date: _____

Submit completed form to EHS Department Industrial Hygienist

STANDARD NUMBER **§ 1910.134** **APPENDIX D (MANDATORY)**

Subpart Z: Occupational Health and Environmental Control

INFORMATION FOR EMPLOYEES USING RESPIRATORS WHEN NOT REQUIRED UNDER THE STANDARD

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational EHS of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

I have received basic instructions on the voluntary use of a filtering facepiece. I understand that improper use of this respirator places me at risk of health hazards. I also understand that use of other types of respirators might require that I meet the full medical and fit-testing requirements of CAP's written Respiratory Protection Program. I have read the above information and agree to use my respirator accordingly.

Employee Signature	Employee No.	Today's Date

Appendix B
Assigned Respirator Types

Job Class	Work Task	Respirator Type	Cartridge Type
Mechanic and Mechanic Apprentices	Welding (mild steel)	3M or Moldex FF	N/A
	Grinding (mild steel)	3M or Moldex FF	N/A
	Welding (chrome) [1]	Miller PAPR weld hood	P100
	Grinding (chrome) [1]	Miller PAPR weld hood	P100
	Welding (chrome) [2]	3M or Moldex FF	N/A
	Grinding (chrome) [2]	3M or Moldex FF	N/A
	Asbestos worker	North 7700 HM APR	P100
	Asbestos	North 7600 FM APR	P100
Maintenance Specialist, Lead Maintenance Specialist, Industrial Painter, or Apprentices	Pesticide Applicator	North 7600 FM APR	OV-AG-P100
	Abrasive blasting	MSA Ultra-View, Clemco Apollo 60, or Clemco Nova 2000 SAR	P100 escape cartridge
	Spray painting	North 7600 HM/FM APR	OV-AG-P100
	Sawing/routing wood	3M or Moldex FF *	P100
	Asbestos worker	North 7700 HM APR	P100
Maintenance Worker	Abrasive blasting	North 7600 FM APR	P100
	Spray painting	North 7600 FM APR	OV-AG-P100
EH&S Staff	Asbestos bulk sampling	North 7600 FM APR or North 7700 HM APR	P100
	Asbestos "clearance" air sampling inside containment	North 7600 FM APR or North 7700 HM APR	P100
Heavy Overhaul Mechanics and Apprentices	Asbestos gasket removal (large or small gaskets)	North 7600 FM APR or North 7700 HM APR	P100
Environmental Compliance Staff	HazCating	North 7600 FM APR or North 7700 HM APR	OV-AG-P100

MUC = Maximum Use Concentration; FF = Filtering Facepiece; MSA = Mine Safety Appliance (manufacturer); PAPR = Powered Air-Purifying Respirator; SAR = Supplied Air Respirator; APR = Air-Purifying Respirator; HM = Half-Mask style; FM = Full-facepiece style; P100 = oil-Proof 99.97% efficiency; OV = Organic vapor; AG = Acid Gas.

1 For welding or grinding work conducted for more than 1 hour per work shift
2 For welding or grinding work requiring less than 1 hour per work shift

NOTE: All cartridge-type respirators use either a combination particulate and chemical cartridge identified by a dual color magenta and yellow cartridge (North part No. 75SCP100; CAP part No. 8010-0012) OR a single stage particulate cartridge identified by a single color magenta cartridge (North part No. 7580P100; CAP part No. 8010-0053).

Appendix C
Cartridge Change-Out Schedule

Type of work activity	Cartridge change frequency
Asbestos work – large & small gasket procedures	Every 8 hours of breath time or weekly – whichever is shorter.
Asbestos work - bulk sampling of suspect ACM	At the end of each sampling episode at a single site.
Asbestos work - air sampling inside a regulated area	Sampling typically requires less than 4 hours to accomplish, therefore change out is required after 4 hours.
Painting and coating operations	Every 4 hours of breath time or weekly – whichever is shorter.
Welding and/or grinding using chrome rod/wire (wearing a full-face air-purifying respirator)	Every 8 hours of breath time or weekly – whichever is shorter.
Welding and/or grinding on stainless steel (wearing a full-face air-purifying respirator)	Every 8 hours of breath time or weekly – whichever is shorter.
Solvent usage (Protective Coatings)	Every 8 hours of breath time or weekly – whichever is shorter.
HVAC cleaning with acids or caustics	Daily (less than 8 hours breath time)
Sump cleaning	Every 8 hours of breath time or weekly – whichever is shorter.
Welding in a ventilated confined space	Every 8 hours of breath time or weekly – whichever is shorter.
Welding and/or grinding stainless steel or using chrome rod/wire (wearing a PAPR welding helmet with HEPA cartridges)	Every 24 hours when local exhaust ventilation is used

CENTRAL ARIZONA PROJECT

THERMAL STRESS AWARENESS PROGRAM

REVISED DECEMBER 12, 2019

SUMMARY – QUICK FACTS

- It normally takes between five to seven days to acclimate to working in a hot environment, but it can take as long as three weeks.

- During this acclimation period, employee's awareness about their body's reaction to heat stress should be heightened.

- Your body does not respond with a "thirst sensation" until more than 2 percent of body weight is lost.

- When performing strenuous activities, the body can lose up to 1 ½ quarts of perspiration (sweat) per hour.

- During heavy sweating, it is necessary to drink 10 to 12 ounces of water every 20 to 30 minutes.

- Drinks containing 40 to 80 grams of sugar and 0.5 to 0.7 grams of sodium per liter can be beneficial.

- Urine color darker than a "pale yellow" is an indication of dehydration.

- CAP will issue a Heat-Alert to help identify those periods of heightened probabilities to heat stress.

CENTRAL ARIZONA PROJECT
THERMAL STRESS AWARENESS GUIDE

1.0 PURPOSE

Central Arizona Project (CAP) employees may be exposed to significant sources of heat stress through their work activities. Procedures in this guide can apply to all employees performing work in hot environments within or on CAP facilities or properties.

This Thermal Stress Awareness Guide is intended to provide employees with the information and guidance necessary to prevent work-related heat injuries and illnesses. The various components of the guide are to be a resource to all CAP employees to ensure that we continue to offer a safe and healthy work environment.

2.0 APPLICATION OF GUIDE

All work activities conducted by CAP employees in hot environments will be evaluated by all involved to determine if the environment could have a heat component, which could create a risk for thermal stress. Where a risk could be present, all involved will engage engineering controls and work practices controls, as well as acclimation and hydration efforts, to minimize the stresses of hot work places.

3.0 HEAT STRESS DISORDERS

Heat is generated in the body by muscle activity and metabolic functions and this heat increases as the workload increases. Heat from the work environment can decrease the body's ability to eliminate this metabolic heat. Environmental heat includes air temperature, direct sun exposure, air velocity, humidity, and radiant heat (running motors, reflected heat from buildings and water, hot metal surfaces, etc.). Working in a hot environment can pose special hazards to the health and safety of employees, including heat-related fatigue and actual illness. Heat increases the potential for accidents due to sweat in the eyes, slippery hands, fogged glasses, irritability, impaired judgment, or slower physical and mental reaction.

3.1 **The Five Heat-Related Illnesses**: There are five major categories of heat related illness:

3.1.1 **Heat Stroke** – Heat stroke is the most serious heat-related illness. It is always life-threatening because a person's temperature is so high it can cause brain damage and/or organ failure. It is caused by dehydration and the failure of the body's temperature regulating mechanisms.

Heat stroke symptoms usually include:

- Core temperature over 105° F
- Hot, dry skin (may be mottled, red or bluish)
- Mental confusion, loss of consciousness, and/or
- Convulsions or coma

Treatment for heat stroke includes:

- Call for help immediately. Medical treatment is imperative to prevent permanent injury to the brain and other vital organs.
- Remove the victim from the heat and/or sun.
- Immediately start cooling victim with ice packs, cool water, cool compresses, (never put ice directly on the skin), and increasing air movement (fans).
- Do not give the victim anything to drink, especially tea, coffee, or alcoholic beverages.
- Never give anything by mouth to someone who is unconscious.

3.1.2 Heat Exhaustion – Heat exhaustion is caused by the loss of body fluid and salt from sweating, decreased blood circulation to the brain and organs, or both. It is caused when a person does not take in enough water, electrolytes, or both. It is less serious than heat stroke, but can become serious and lead to heat stroke if not treated.

Symptoms usually include:

- Clammy, pale or flushed moist skin
- Extreme fatigue, headache, nausea
- Rapid pulse and low blood pressure
- Oral temperature that is normal or only slightly elevated

Treatment:

- Remove the victim to a cooler area and give them water as they desire (but never any liquids with caffeine or alcohol). "Sports" drinks may be consumed if desired, or slightly-salted water (only if not on a restricted diet). "Slightly-salted" means ¼ teaspoon or less of salt per gallon of water.
- Have the victim rest with their feet slightly elevated.
- Cool the body with ice packs (never place ice directly on the skin) or cool water if needed.
- Fanning the body to increase evaporation of sweat or water can help.

- If the victim becomes unresponsive or unconscious, call for help immediately and arrange for emergency response
- Some cases of heat exhaustion may take several days or longer for full recovery and the person will continue to be a higher risk of heat stress illnesses after experiencing heat exhaustion

3.1.3 Heat Cramps - Heat cramps are painful spasms of the working muscles of workers who are drinking large quantities of water, but have some salt depletion. The cramps may occur during or after working hours and are usually relieved by drinking slightly-salted water (approximately ¼ teaspoon of salt per gallon of water).

Symptoms usually include:

- Painful spasms of muscles used during work (usually arms, legs, or abdomen).

Treatment:

- Drink slightly-salted water or "sports" drinks (unless on medical restriction). Use adequate salt amount during meals.

3.1.4 Heat Syncope / Fainting – Syncope / fainting may occur in workers who are not acclimated and stand still in the heat. Blood normally circulated to the heart and brain is sent to the skin for cooling, and pools in the enlarged blood vessels in the skin and in the lower part of the body. It may be prevented by moving around, assuming no other complications occur.

Symptoms usually include:

- Fainting or becoming dizzy while standing in the heat.

Treatment:

- Remove the victim to a cooler area.
- Allow them to drink water.
- Recovery should be prompt.
- Consult a physician if the condition persists

3.1.5 Heat Rash (prickly heat),

Symptoms Usually Include:

- "Prickly heat" or “miliaria” may occur in humid environments where sweat is not easily removed from the skin by evaporation.
- The sweat ducts become plugged, become inflamed, and a rash develops. Infection is a possibility.
- When extensive or complicated by infection, heat rash can be so uncomfortable that it impedes a person’s performance or even results in a temporary total disability.

Treatment:

- Includes cooling and drying the skin and avoiding conditions that cause sweating.
- If infection develops, have it treated by a physician.

4.0 HEAT STRESS PREVENTION

Heat related illnesses can be prevented through a number of means, including acclimation, proper hydration, electrolyte and salt replacement, and engineering and work practices controls.

4.1 Acclimation: Acclimation is a process by which a person's body adjusts to the hot environment over a period of time, usually five to seven days according to OSHA. However, the process may take up to three weeks, depending on the individual and their work environment. According to the American Industrial Hygiene Association, the process requires a consistent work level for at least two hours each day during the acclimation period in order for a worker to become acclimated. Mere exposure to heat does not acclimate someone, nor does acclimation at one heat stress level confer resistance to heat stress at a higher temperature or more vigorous work load.

The allowable heat load exposure for an un-acclimated worker is several degrees lower than that of someone who is fully acclimated. This can be of issue for new CAP employees, who may not be used to Arizona's extreme weather. People who are not sufficiently acclimated to the heat may experience heat fatigue resulting in a decline in performance, coordination, or alertness. They may also become irritable or depressed. This can be prevented through gradual adjustment to the new hot environment. People in good physical condition tend to acclimate better because their cardiovascular systems respond better, allowing their body to more easily adjust to the hot environment.

It is the supervisor’s responsibility to be aware of and accommodate for this adjustment period in the manner that work is assigned / scheduled and allow for a reasonable amount of rest periods, according to individual requirements, and to

allow a re-acclimation period after an absence from work of a week or more or if the person is returning to work from an illness.

4.2 **Hydration:** Thirst is a mechanism the body uses to signal the need for water replacement. In sedentary, non-heat stress conditions, drinking to quench thirst adequately regulates body hydration. However, in heavy work heat stress conditions, thirst sensation lags behind the actual need for water. The body does not typically respond with thirst until more than two percent of body weight is lost. If a person in heavy work/heat stress conditions only drinks to quench their thirst, water intake will significantly lag behind water loss for up to several hours after heat stress conditions cease.

Because of this, dehydration is a major factor in most heat disorders. The average body loses approximately 2½ quarts of sweat a day. When performing strenuous work, the body can lose up to 1½ quarts of sweat per hour. It is essential to drink more than is needed to satisfy thirst. It is necessary to drink 10-12 ounces of water every 20-30 minutes during heavy sweating.

Employees should be careful to consume a well-balanced diet and drink plenty of non-alcoholic beverages in the day preceding severe heat exposures. Employees should avoid diuretic drinks, including coffee, tea, commercially made fruit juices, energy drinks, and sodas because they take more water to remove them from your body. Just prior to work in a hot environment, drink as much as a half-liter of plain water. During work, employees should try to drink as much and as frequently as possible. Drinks containing 40 - 80 grams of sugar per liter and 0.5 to 0.7 grams of sodium per liter can be beneficial. Employees should be encouraged to rehydrate between work shifts.

Urine color is another indicator of hydration. The normal color for urine should be a pale yellow. Anything darker than this is an indication of dehydration. Certain medicines and vitamins may cause the color of the urine to change. If any of these have been taken, this basic color test is unreliable.

4.3 **Electrolyte and Salt Replacement:** Sweat not only eliminates water from the body, but salt (sodium chloride) and other electrolytes (sodium, potassium, and magnesium) too. The body needs a certain amount of salt to function properly, but salt tablets are not recommended because of stomach irritation, nausea, and vomiting. Employees should drink normal water throughout the day, but may drink an electrolyte solution such as Gatorade after working in a hot

environment, if desired. Normally, eating a good breakfast and lunch will provide adequate salt intake during a hot workday. Individuals on a salt restricted diet or those persons being treated for high blood pressure or heart problems must NOT try to replace salt without the advice of their physician.

4.4 Engineering Controls: Engineering controls can include any of the following:

- Ventilation – general ventilation to dilute hot air with cooler air from outside an enclosure.
- Evaporative Coolers – air cooling by use of portable evaporative coolers to significantly reduce heat loads.
- Air Conditioning – air conditioning that provides much cooler air and increased capacity for evaporative cooling.
- Cool Break Area – a cooled or air conditioned rest room or trailer at the work site for employees to take a break.
- Heat Barriers – shielding or barriers between the worker and a heat source that can significantly improve heat stress as long as the barrier does not interfere with air flow.

4.5 Work Practice Controls: Work practice controls can include any of the following:

- Modified Work Schedule – scheduling work for earlier in the workday such as starting work at 4:00 a.m. to take advantage of the cooler morning temperatures, or, if possible, re-schedule the work to be done in October through April.
- Limit Exposure – limiting the time (in hours) that the worker spends in the hot environment.
- Reduced Work Demands – reducing the labor demands by increasing the number of workers.
- Tool and Equipment – use of special tools such as power tools, hoists, and lifts, to ease the workload and decrease the workers' metabolic rate.
- Knowledge - learning to recognize early signs and symptoms of heat illnesses and know how to administer first aid.
- Buddy System – implementation of a "buddy-system" in which workers observe fellow workers for symptoms of heat intolerance.
- Adequate Cool Drinks – providing adequate amounts of cool (50° to 59°F.) water near the work area and encourage drinking five to seven ounces of water every 15 to 20 minutes.

4.6 Impact of Protective Clothing: Loose fitting clothes made of light cotton allow sweat to evaporate and transfer heat better than tight fitting synthetic fibers.

Wear a hat to shade the head but ensure the hat has adequate ventilation of the head itself. A significant amount of heat can be dissipated from the head and, if the hat cannot ventilate this heat, it actually is more harmful than helpful.

If the work activities require the use of personal protective equipment such as chemical resistant gloves or Tyvek-type coveralls, this will inhibit the evaporative cooling effect of sweating. Special precautions need to be taken to ensure that employees do not over-heat due to this lack of evaporative cooling. When wearing these types of PPE, employees should consider more frequent breaks, during which the PPE should be removed (fully or partially), to allow evaporation of the sweat and provide for cooling of the body's core temperature. Drink "cooler" water (approximately 50°F. but not less than 40°F.) to assist in cooling the internal organs.

4.7 **Heat-Alerts:** A written Heat-Alert will be developed and implemented whenever the National Weather Service or other competent weather forecast service indicates a heat wave is likely to occur on the following day or days. At CAWCD, a heat wave is indicated when the daily maximum temperature exceeds 110°F. or when the daily maximum temperature exceeds 100°F. and is 9° F. or more above the maximum reached on one or both of the previous two days.

Example: *If the temperature on Monday was 99°F. and on Tuesday it was 98°F. On Wednesday the temperature is forecast to be 108°F. CAWCD would declare a Heat-Alert as the temperature was above 100°F. and was 9°F. greater than the maximum on Monday.*

When a Heat-Alert is issued by the EH&S Department, the following actions should be taken:

- EH&S Department will prepare and distribute a written Hazard Alert indicating that a Heat-Alert is declared for CAP.
- CAP employees are responsible to limit their exposures to heat stress in compliance with this Thermal Stress Awareness Guide.

5.0 EMPLOYEE INFORMATION AND TRAINING

All employees that will be potentially exposed to extreme heat should be trained prior to exposure. Refresher training should occur regularly thereafter, preferably annually; more often if the need arises. Training of employees should cover the following topics:

- Heat stress hazards.

- Predisposing factors and relevant signs and symptoms of thermal stress injury and illness.
- Potential health effects of heat stress and cold stress and appropriate first aid procedures for each.
- Employee responsibilities for following proper work practices and control procedures to help protect the health and provide for the safety of themselves and their fellow workers, including instructions to immediately report to their supervisor the development of signs or symptoms of thermal stress overexposures.
- The effects of therapeutic drugs, over-the-counter medications, or social drugs (including alcohol), that may increase the risk of heat injury or illness by reducing heat or cold tolerance.
- The purposes for and descriptions of the environmental and medical surveillance programs and of the advantages to the worker of participating in these surveillance programs.
- As necessary, proper use of protective clothing and equipment.

6.0 RECORDKEEPING

Copies of this Thermal Stress Awareness Guide are kept in the EH&S Department and are available to all employees who wish to review them. They are also posted in Content Server. Also maintained in the EH&S Department are copies of training and other environmental monitoring records. These records will be updated as employees are trained or receive refresher training, and as additional testing is conducted. The medical records for all employees covered under this program may be maintained by the medical provider, but copies can be obtained by CAP employees through the EH&S Department.