TVA Safe Work Requirements Manual

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Change Log for Revision 10 available here.

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Purpose and Scope

The Safe Work Requirements Manual provides employees of Tennessee Valley Authority (TVA) and its contractors with safe work requirements and instructions for performing tasks or when exposed to hazards associated with tasks. In certain situations, there are procedures available on the TVA Safety SharePoint that contain more information and/or requirements about a particular task. When that is the case, the procedure number is listed in that section.

The Safe Work Requirements Manual is a safety related document and part of the TVA Safety Program as described in TVA-SPP-18.001, Safety Program. Roles and responsibilities for the Safety Program and its contents are outlined in TVA-SPP-18.001, Safety Program.

Business Units (BUs) may have business unit specific procedures pertaining to certain sections of this manual. Where that is the case, employees shall follow their business unit specific procedure. BUs shall submit initial issuance and revisions with intent changes to TVA Safety for a regulatory review against OSHA requirements and any TVA Safety governance procedures.

In certain cases, labor agreements may dictate which job positions may perform certain tasks. Questions about labor agreements and job assignments shall be directed to TVA Labor Relations.

The safe work requirements in this manual are applicable to all TVA locations and locations where TVA has a legal interest, such as right of ways. Contractors are responsible for following TVA requirements.

Training is required before operating tools, equipment and machinery and before performing certain tasks. In some cases, trainees/apprentices may operate tools, equipment and machinery under the direct supervision of a trained employee. Employees who have questions about training requirements or who are uncertain if they are properly trained shall stop and contact their supervisor. Training courses are maintained by TVA Technical Training and descriptions may be found in the Learning Management System (LMS). Where training is required, contractors are expected to provide training to their employees except where TVA requires that contractors receive TVA training as noted in TVA-SPP-18.004.

Any employee or contractor who has concerns about the ability to work safely or the ability to comply with safe work requirements has the authority and responsibility to stop work. Supervision shall be contacted, and the issue shall be elevated until there is consensus that the work can be safely executed. While employees can contact OSHA at any time, the preferred escalation order is as follows:

1. Direct Supervisor
2. Site Management
3. Site/Regional Safety consultant and/or Local or Regional Health and Safety Committee
4. Business Unit Leadership
5. Agency Health and Safety Committee by contacting TVA Safety or Bargaining Unit Representative.

1 Aerial Lifts

1. All aerial lifts must:
    a. Be equipped with a manufacturer's model specific operating manual.
    b. Be designed and constructed in accordance with the applicable national consensus standard and OSHA requirements governing the specific type of aerial lift.
    c. Be conspicuously identified with the following information:
        i. Make
        ii. Model
        iii. Insulated or non-insulated
        iv. Qualification voltage and date of test (if insulated)
        v. Serial number
        vi. Rated load capacity of boom and basket
        vii. Maximum working height
2. Comply with TVA-TSP-18.815, Temporary Traffic Control, when used on public roads.
3. Never operate an aerial lift unless properly trained. Review and be familiar with the manufacturer's operating manual for the specific manufacturer and model of equipment being used.
4. Perform and document a pre-lift inspection on TVA Form 20738, Aerial Lift Operator Checklist or equivalent prior to operation of the lift at least once per shift when the lift is being used in that shift.
5. Annual inspections shall be performed and documented on TVA Form 20737 Aerial Lift Maintenance Checklist.
6. Operate the aerial lift through its normal operating positions using ground controls prior to lifting personnel. Guidance is provided in the operating manual.
7. Do not use outriggers on aerial lifts on soft or uneven surfaces without proper padding and cribbing to ensure stability.
8. Keep platforms free of slippery substances. Secure loose objects and tools.
9. Do not exceed boom and bucket load limits specified by the manufacturer.
10. Never alter the insulated portion of an aerial lift.
11. Do not refuel while the engine is running, while personnel are in the basket, or while in 161-kV or 500-kV switchyards.
12. Wear a hard hat and proper fall protection attached to the manufacturer-supplied attachment point or to a boom strap anchorage device when working from an elevated basket. If a safety lanyard greater than two (2) feet in length is required, ensure it is a decelerating or self retractable type.
13. When working over a body of water, such as a river, pond or pool, where tie off in an elevated basket could pose greater risk to the employee if the lift were to tip and the employee could be trapped underwater by the tie off, then tie off in an elevated basket is not required. Personal flotation devices are required in this case.
14. When working from a lift, do not anchor to structures or equipment, unless entering or exiting.
15. When fall protection such as guard rails or a fall arrest system is in place while moving between the lift and the working surface, you may enter or exit an aerial lift at heights above 6 feet. The fall arrest system must provide 100% fall protection during this move.
16. During entry or egress from the lift, you may tie off to the lift (if the lift is designed to withstand the vertical and lateral loads imposed by the employee's movement itself or by an arrested fall) or to a nearby structure capable of sustaining the same loads.
17. You may be connected to both the lift and a nearby structure only for the brief period it takes to connect to the location moving to and disconnect from the location you are leaving.
18. Do not sit on or climb onto the lip, the mid or top rail of the basket, or use planks, ladders, etc., in the basket for a work position. Always stand on the basket/bucket floor.
19. Do not wear pole climbers while performing work from an aerial lift bucket.
20. When operating vehicle mounted aerial lifts provided with outriggers, ensure that:

a. The outriggers are extended and firmly set for stability.
b. The vehicle brakes set, and outriggers positioned on proper padding, cribbing or a solid surface.
c. The unit is level prior to operation.
d. Wheel chocks are in place.

21. Position and chock vehicle mounted aerial lifts with outriggers in accordance with manufacturer's instructions. If the manufacturer provides conditions under which lifts can be made without the use of outriggers, then outrigger use is not required if all manufacturer conditions are followed.
22. Do not extend or retract outriggers outside clear view of the operator unless all employees are outside the range of equipment motion.
23. Do not operate ground-level lift controls on aerial lifts with upper controls when an employee is in the lift bucket, except in case of an emergency. Ground level lift controls may be operated for testing provided the basket is empty.
24. Never use any part of a lift as a fulcrum for prying.
25. When aerial lift trucks are positioned for work, park them in a manner that provides adequate employee protection from traffic and other hazards. Place safety signs, barricades and lights as additional protection when necessary.
26. Do not operate aerial lifts in high winds or adverse weather conditions. Wind limits are set by the manufacturer and can be found in the operating manuals.
27. Drive aerial lift trucks with the arms or boom properly stowed and the outriggers retracted. Remove and properly store outrigger pads before driving over the road.
28. Check all controls before moving the unit into work position, including proper placement of outriggers. Before starting aerial work, check the condition, leveling, and position of the aerial lift. Closely inspect and check distances to structures, conductors, and any other potential obstruction.
29. Never move an aerial lift truck when the boom is elevated or when personnel are in the basket. For other types of aerial lift devices, movement is permitted only if permitted by manufacturer's instructions and all manufacturer requirements are met.
30. Do not use cell phones during the operation of aerial lifts. This includes talking, texting or use of any applications which may be on the phone.
31. When operating aerial lifts in congested areas, exercise caution. Identify specific hazards implement mitigation measures such as barricades, vested flaggers, etc. to prevent injury to personnel or damage to equipment and structures.
32. Each lift device with the boom fully extended in the horizontal position shall be capable of sustaining a static load 1-1/2 times its rated capacity when the vehicle is on a firm and level surface.
33. Articulating boom and extendible boom lifts, primarily designed as personnel carriers, have the following requirements:
    a. Be equipped with both upper and lower controls. The upper controls shall be within easy reach of the operator in the platform basket.
    b. A foot-operated constant pressure switch shall be installed in the basket.
    c. Upper controls shall be protected to prevent jamming.
    d. Lower controls shall be provided for overriding the upper controls in the event of an emergency.
34. Where the elevation of the boom is accomplished by means of a hydraulic cylinder assembly, the system shall be equipped with pilot-operated check valves or other appropriate devices to prevent free fall of the boom in the event of hydraulic line failure.
35. Booms utilized for bare-hand, live-line, high-voltage work shall have built-in, self-contained electrodes and testing circuitry for ease in checking and testing the dielectric characteristics of the boom and its associated components.
36. Aerial lifts utilized for bare-hand, live-line, high-voltage work shall be provided with an audible leakage current alarm (which is activated when current leakage exceeds the permissible limits) or with a meter that can be monitored from the ground.

37. A leveling system shall be provided which automatically maintains the basket in a level position through all elevations of the working boom.
38. On equipment provided with hydraulic outriggers, the outriggers shall be provided with check valves to lock the outriggers in the extended position during operation and in the retracted position for road travel.
39. Each aerial lift shall be equipped with at least a 2-1/2 pound dry chemical fire extinguisher accessible from the ground.
40. Aerial ladder trucks shall be provided with a locking device on top of the truck cab and a manually operated device at the base of the ladder for securing the ladder in the lower traveling position.

1.1 Scissor Lifts

1. Inspect controls and components before use.
2. Ensure the work location has a firm and level surface to prevent tipping.
3. Be aware of overhead hazards, including overhead electrical lines,
4. When moving the lift, ensure the lift is lowered or moved in accordance with manufacturer instructions.
5. The general requirements for all scaffolds and mobile scaffold requirements shall apply to scissor lift operation.
6. Never overload the scissor lift.
7. Tie off is required in scissor lifts when tie off points are supplied by the manufacturer. Use anchorage devices that are the decelerating or self-retracting type.
8. Do not use scissor lifts in high wind or adverse weather conditions.

1.2 Energized Work - Insulated Aerial Lifts

1. Before starting actual work:
    a. Check the condition of the lift, bucket liner, and bonding leads.
    b. Ensure the truck is grounded.
    c. Check the weather forecast to ensure that weather conditions will be suitable at the location where the work is to be performed. Suspend energized work if weather conditions become unsafe.
2. Perform a leakage-current reading before starting work each day and each time during the day when any higher voltage is going to be worked on. This test shall consist of placing the bucket in contact with an energized source equal to the voltage to be worked on for a minimum time of three minutes. The leakage current shall not exceed one micro-ampere per kilovolt of nominal phase-to-ground voltage. Leakage-current meters shall be re-calibrated annually.
3. When the lift is used for energized work, an employee trained and qualified in emergency let-down shall be onsite and available.
4. Before contacting any conductor or device, attach bucket-bonding leads to the conductor or device to establish yourself at the same potential as the conductor or device to which you are clipped. If you are not at the same potential, do not touch it.
5. Work only on one phase at a time. Bonding leads from a single aerial lift shall be attached to the same conductor or sub conductor and only one phase worked at a time. Minimum clearances shall be maintained.
6. Maintain the Minimum Clearance Distances for Energized Work from all grounded objects and from lines and equipment at a potential different from that to which the live-line, bare-hand equipment is bonded.
7. While approaching, leaving, or bonding to an energized circuit, maintain the Minimum Clearance Distances for Energized Work between yourself and any grounded parts, including the lower boom and portions of the truck.
8. While the bucket is positioned alongside an energized bushing or insulator string, maintain the phase-to-ground minimum clearance distances between all parts of the bucket and the grounded end of the bushing or insulator string or any other grounded surface.

9. Suspend operations immediately and return the bucket to ground as soon as safely possible when the leakage current meter alarm sounds or upon indication of a malfunction in the aerial lift that would render the job unsafe.
10. Do not bridge the insulated section of the arm with un-approved equipment while doing energized work.
11. A designated safety observer other than the equipment operator shall observe the clearance distance of the non-insulated portion of the boom to energized lines and equipment and give timely warning before the minimum approach distance is reached. The observer may be on the ground or in the bucket. Warnings may be given via verbal instructions or hand signals.
12. Un-insulated tools, equipment, or materials from any ground source shall not violate the required working clearance around the employee and the bucket while the bucket is bonded to an energized part. Overhead ground wires not grounded shall be considered energized.
13. Use only ropes or lines maintained especially for live-line work (Yale Cordage Hy-Dee Braid rope, green in color) from an insulated aerial lift while work is being performed on energized lines or equipment.
14. Before starting actual work, inspect and check distances to structures and conductors. In addition, check the tightness and integrity of the vehicle ground.
15. Use protective equipment of properly rated voltage for the work being performed, such as line hose, insulator hoods, and rubber blankets.
16. Never enter or leave an insulated aerial lift basket while performing energized work except under the direction of the responsible supervisor.
17. In the event of an emergency, arc, or flashing, crouch as low as possible in the bucket.
18. Follow manufacturer's recommended procedures to ensure that all the air is bled out of the hydraulic hoses every day before using the aerial lift on any work.

1.3 Non Insulated Aerial Lifts

1. Properly ground equipment before work is begun near energized or de-energized equipment.
2. When non-insulated aerial lifts are used to work on grounded conductors, the equipment shall be grounded to the work site equipotential protective safety ground system.
3. An employee trained and qualified in the emergency letdown procedure shall be onsite and available.
4. Before touching or working on grounded conductors from non-insulated aerial lifts, a clip lead or other bonding connection shall be placed between the basket and the conductor.
5. Suspend operations immediately if there is any indication of an equipment malfunction that could affect safe performance of the job.
6. A designated safety observer other than the equipment operator shall observe the clearance distance to exposed energized lines and equipment and give timely warnings before the minimum approach distance is reached. The observer may be on the ground or in the basket. Warnings may be given via verbal instructions (voice or radio) or hand signals.
7. If during operation, the equipment could become energized by contact, the operation shall comply with at least one of the following:
    a. The energized lines exposed to contact shall be covered with insulating protective material that will withstand the type of contact that might be made during the operation.
    b. Each employee shall be protected from hazards that might arise from equipment contact with the energized lines. The measures used shall ensure that employees will not be exposed to hazardous differences in potential. Examples include:
        - Properly grounding heavy equipment and vehicles used in the performance of energized transmission work.
        - Keeping bonding equipment together to minimize potential differences.
        - Providing ground mats to extend areas of equipotential.
        - Employing insulating protective equipment or barricades to guard against any remaining hazardous potential differences.

8. A preventive maintenance, inspection, and test program shall be established in accordance with the manufacturer's instructions, ANSI/SAIA A92.2**,** Vehicle Mounted Elevating and Rotating Aerial Devices, and/or other regulations.
9. Before an aerial lift is placed in service, stability tests shall be performed in accordance with the applicable standard. Written certification verifying stability tests performed by the manufacturer are acceptable in lieu of physical tests by TVA.
10. All electrical tests of aerial lifts shall comply with the requirements of ANSI/SAIA A92.2. However, equivalent direct current voltage tests may be used in lieu of the alternating current voltage tests.
11. All insulated aerial lifts to be used for live-line, bare-hand work shall be subjected to a leakage-current test in accordance with ANSI/SAIA A92.2:
    a. Before starting work each day; or
    b. Each time during the day when higher voltage is going to be worked; or
    c. When the job location is changed.
12. Insulated aerial booms shall be kept clean from accumulations of dirt and conducting or other contaminating materials, which could reduce the dielectric characteristics of the boom. The boom shall be cleaned semiannually or more often if exposed to adverse environmental conditions. The boom shall be wiped with clean rags or washed with a mild household detergent, rinsed with cold water, and dried. Pressurized water or steam is not to be used.
13. The manufacturer's recommendations shall be consulted for instructions on removal of substances such as tar from the boom. A silicone compound may be used to help prevent accumulation of contaminating materials.
14. The boom shall be inspected annually and at more frequent intervals if exposed to heavy uses or adverse environmental conditions. The inspection shall include, but is not limited to, the following:
    a. Light spots caused by impact blows. Light spots may not significantly reduce the mechanical strength or dielectric properties of the boom. Repair is not necessary unless surface roughness exists, or dielectric tests indicate reduced insulating characteristics caused by the light spots.
    b. Surface ruptures may be repaired by removing the damaged fibers, cleaning the void with acetone or methyl ethyl ketone, and applying epoxy bond to the damaged area. The epoxy bond shall be allowed to harden a minimum of four hours before the boom is used. Methods and material used for repair must conform to the manufacturer's recommendations. Applicable safety and environmental regulations must be met in the use and disposal of solvents used.
    c. Damaged areas where there is considerable fiberglass rupture. The mechanical strength and dielectric properties of the boom may have been affected if a large number of glass fibers have been cut or broken. The boom shall be thoroughly examined to determine if replacement is necessary. Cut or broken glass fibers cannot be satisfactorily mended. If the mechanical strength or dielectric properties have been affected, a defective equipment tag shall be attached to the boom and the equipment withdrawn from service for replacement.
15. After cleaning and repairing the boom, the fiberglass finish shall be restored by applying a wipe or brush coating of polyurethane. Appropriate personal protective equipment shall be utilized during the cleaning, repairing, and restoration operations.
16. Before an aerial lift is transported, the aerial lift shall be inspected. Ensure the boom is properly cradled, secured, retracted, and in the stowed position.
17. All inspection records shall be retained for a period of one year and shall be readily available for review.

2 Abrasive Blast Cleaning

1. Understand the proper operation of the abrasive blast equipment and operate the equipment in accordance with the manufacturer's instructions.
2. Review the applicable safety data sheet (SDS).
3. Plan the work. Include precautions to protect all personnel not involved in the abrasive blasting operation. Signs stating "Sandblast Area - Do Not Enter" must be used in conjunction with perimeter barricades, containment structures, and other physical barriers.
4. Ensure an exposure assessment is conducted prior to performing work to determine potential exposure levels. Contact a TVA Safety Professional for assistance.
5. Establish and maintain adequate perimeter boundaries based on air-monitoring results.
6. Evaluate the health hazards associated with the spent abrasives. Wear the proper PPE. Consult a TVA Safety Professional for guidance on necessary PPE and protective measures.
7. Understand the physical and health hazards associated with abrasive blast cleaning, such as high-pressure air, dust, airborne contaminants and noise.
8. Consider engineering and administrative controls to help reduce exposures. Examples include:
    a. Nontoxic, silica-free blasting agents
    b. Ventilation
    c. Dust-suppression techniques such as water mists or steel shot
    d. Containment
    e. Scheduling abrasive blasting operations during off-shift hours
    f. Locating permanent sandblasting facilities in remote areas
    g. Rotating affected personnel to manage exposure to heat and noise
9. Wear the following PPE when working inside an abrasive blast-cleaning room or when performing manual abrasive blast cleaning:
    a. MSHA/NIOSH-approved abrasive blasting hood.
    b. Durable apparel closeable at wrists, ankles, and other openings to prevent entry of abrasive dust
    c. Leather or similar heavy-duty apron
    d. Current ANSI Z87.1 approved side-shield industrial safety glasses worn under the hood unless the hood manufacturer confirms that the face shield assembly meets current ANSI Z87.1 requirements
    e. Heavy canvas or leather gloves with gauntlets
    f. Hearing protection
10. Clean up abrasive blast media each day the room is used and properly store all related safety gear and other equipment.
11. Do not work alone when:
    g. Performing any manual abrasive blast cleaning
    h. Working in an abrasive blast-cleaning room
    i. Using a bottled air breathing system
    j. The operator's ability to receive emergency alarms and communications is impaired
    k. Barricades must be maintained
    l. Operating an abrasive blast cabinet
12. Abrasive blasting equipment shall be equipped with a dead man switch at the nozzle and an automatic shutoff valve (excess-flow valve) must be provided between the compressor and the air-supply hose.
13. Maintain equipment according to manufacturer's instructions and applicable regulations.
14. When abrasive blasting in areas containing potential fire or explosion hazards, take the following precautions:
    m. Ground all tanks and equipment being blasted. Ensure that the blast machine is electrically connected to the same ground.
    n. Use an antistatic type abrasive blast hose.

o. Electrically bond and ground the abrasive blast nozzle to prevent buildup of static charges. For areas where static charge is a hazard, consider the use of an abrasive blast medium that does not produce static.

3 Arc Flash

1. Perform all work with arc flash potential in accordance with TVA-TSP-18.1022, Arc Flash Protection.
2. Mark/identify the full distance of the arc flash boundary once established.
3. Do not enter a defined and marked arc flash boundary unless you are trained, understand the specific hazards associated with arc flash, and are wearing the proper PPE.
4. When using an entire room as an arc flash boundary, barricade the entrance so unauthorized personnel cannot enter.
5. When designated to wear AR daily-wear clothing, wear the AR clothing for the length of the shift, unless your job assignment temporarily changes to clearly exclude potential exposure to arc flash hazards, i.e., classroom training, conferences, etc.
6. Clean AR clothing in accordance with the instructions in TVA-TSP-1022, Arc Flash Protection.
7. Roll down sleeves and button shirt at collar and cuff when exposed to arc flash potential.
8. Perform live-dead-live checks to verify electrically safe conditions.
9. Use a job safety analysis specific to the type of equipment or component and work activity when working on equipment with a calculated incident energy greater than 40 cal/cm2 and/or working on exposed energized parts greater than 480 volts.

4 Brush Cutting, Trimming and Chainsaws

1. Wear proper clothing and personal protective equipment when using brush cutting, trimming and chainsaw equipment.
2. Always inspect equipment before use. Replace any caps opened during the inspection before operating.
3. Ensure all shields, guards, access panels and safety devices are secure and working properly.
4. Immediately tag and remove from service any equipment without all safety devices operational or in need of repair or parts or otherwise not safe for use.
5. Never modify equipment. Use and maintain equipment in accordance with manufacturer's instructions.
6. Never start or run engines indoors or where there is poor ventilation.
7. Keep unnecessary personnel away from starting and operating areas.
8. Check the work area for hazards such as stones, glass, metal, uneven ground, and debris.
9. When refueling equipment:
    a. Refuel before starting work while the engine is cool.
    b. Use funnels to avoid spillage when refueling is necessary while the engine is hot.
    c. Wipe the equipment clean of any fuel spillage.
10. When equipment has a muffler, make sure the muffler is secure.
11. Start equipment on firm ground or other solid surfaces.
12. Maintain good balance and secure footing during equipment operations.
13. Shut off the equipment before performing any maintenance, cleaning, or before putting the equipment down or leaving it unattended.
14. When transporting equipment, ensure the equipment is secure. Use carrying guards where provided.
15. Correct only those problems for which you are adequately trained and for which the proper tools and assistance are available.
16. When pruning, watch for falling limbs and trip hazards. Determine limbs to be cut, e.g., height, live or dead, diameter, and length., plan an escape route and remove trip hazards.

17. Carry the power pruner with the engine stopped and the hot muffler away from your body. Prevent any contact with the cutting chain.
18. Be prepared for spring back when cutting a limb that is under tension.

4.1 Brush Chippers

1. Brush chippers shall be equipped with a locking device in the ignition system.
2. Brush chippers not equipped with a mechanical in-feed system shall be equipped with an in-feed hopper of length sufficient to protect employees from injury.
3. Chock or otherwise secure trailer chippers detached from trucks.

4.2 Stump Cutters

1. Stump cutters shall be equipped with enclosures or guards to protect employees.
2. Each employee in the immediate area of stump grinding operations (including the stump cutter operator) shall wear personal protective equipment.

4.3 Chainsaw Operations

1. Chainsaw operations include handheld or pole saws.
2. Every chainsaw shall be equipped with a chain brake.
3. Never remove or disable anti-kickback devices.
4. Chainsaws shall be equipped with a continuous pressure throttle control system which will stop the chain when pressure on the throttle is released.
5. Always operate and adjust chainsaws in accordance with the manufacturer's instructions.
6. When cutting material other than wood, ensure you are using the correct tool. For example, when cutting plastic pipe, refer to the manufacturer instructions to ensure the chainsaw is intended for this task.
7. Never operate a chainsaw alone. Work in crews of two or more.
8. Fuel chainsaws at least 10 feet from any open flame or other source of ignition.
9. Start chainsaws at least 10 feet from the fueling area.
10. Always start the chainsaw with the chain brake engaged.
11. Hold the chainsaw with the thumbs and fingers of both hands encircling the handles during operation.
12. Never use a chainsaw in a position or at a distance that could cause the operator to become off balance, to have insecure footing, or to relinquish a firm grip on the saw.
13. Prior to felling any tree, clear away brush or other potential obstacles which might interfere with cutting the tree or using the retreat path.
14. Do not use a chainsaw to cut directly overhead.
15. Always carry chainsaws in a manner that will prevent contact with the cutting chain and muffler.
16. Shut the chainsaw down or engage the chain brake when a saw is carried farther than 50 feet. The chain saw shall be shut down when a saw is carried less than 50 feet if conditions such as terrain, underbrush, and slippery surfaces may create a hazard for an employee.
17. Do not use chain saws to cut wood that may contain nails or bolts.
18. Fuel for chain saws shall not be used for starting fires or as a cleaning agent.
19. At a minimum, PPE shall include:
    a. Gloves
    b. Chaps or other approved chain saw leg protection
    c. Safety footwear. Chainsaw protective boots are recommended.
    d. Hard hat
    e. Hearing protection
    f. Eye protection, including protective face screen
    g. Consider long sleeves in certain conditions such as briars, heavy brush, etc.

20. Frequently inspect the chainsaw (more than once per day) to ensure that:
    a. Chain saw handles and guards are in place and tight. This includes having an operational chain brake.
    b. All chain saw controls function properly. This includes having a saw equipped with a safety throttle which shuts off power after pressure on the throttle is released.
    c. The cutting chain is properly adjusted, and the saw chain will not continue to be driven after the throttle is released.
    d. The muffler is operative (and equipped with a spark arrester).
    a. Chain brakes and all other manufacturers' safety features remain operational.
    b. Saw will idle without the chain moving.
21. Electric chainsaws may require special precautions and PPE considerations. Refer to the owner's manual or manufacturer instructions

5 Boating

1. Boats shall be equipped with:
    a. A distress signal device.
    b. The required number of Coast Guard approved fire extinguishers.
    c. A secondary means of propulsion (second small engine, oars, paddles).
    d. Running lights if operated in pre-dawn and night conditions
2. Complete a pre-trip boat and vehicle inspection.
3. Inspect all drain plugs for proper installation before launching the boat.
4. Ensure battery terminals are covered to prevent contact with tools, gas cans, etc.
5. Boat Operators must:
    a. Be authorized by the supervisor in charge to operate a boat.
    b. Be qualified to safely operate the craft.
    c. Know the water safety rules, the meanings of buoys, and the various distress signals.
6. Complete the TVA required training courses for boating safety prior to operation of a boat.
7. When in the boat, wear an approved Coast Guard personal Flotation Device (PFD) at all times the boat is in the water. See the Personal Protective Equipment section of this manual for specific PFD requirements.
8. Remain seated while starting the boat's motor unless the boat is specifically designed for the operator to stand.
9. Check the weather forecast before getting the boat under way. Avoid hazardous weather.
10. Reduce speed when operating in unfamiliar waters.
11. The kill switch cord shall be attached to the operator when operating an outboard motorboat or inboard motor boat without a cabin.
12. In boats 16 feet or less, do not stand up or move about when the boat is under way.
13. Do not operate boats with less than two people.
14. Notify your supervisor or other responsible person of the planned route and expected time of return. The person that has been notified of the planned route shall remain at their work location or available by cell phone until verification is made that the boaters are off the water.
15. Know how to avoid hypothermia and how to treat it.
16. Do not use cell phones while the boat is in motion. This includes talking, texting or use of any applications which may be on the phone.
17. When loading a boat:
    a. Distribute the load evenly.
    b. Keep the load low and secure it when necessary.
    c. Do not exceed the manufacturer's recommended capabilities for material and personnel.

18. When on the water:
    a. Be sure motor is out of gear before cranking.
    b. Give the right of way to vessels approaching in your danger zone on the starboard (right) side. If necessary, slow down, stop or reverse, or turn right to cross the stern (rear) of the other craft.
    c. Hold the course and speed when being passed or when approached by another boat from your port (left) side.
    d. Do not turn a small craft at high speeds.
    e. Tilt the engine when running in shallow water and travel slowly. Shut the engine off immediately if the propeller strikes any obstruction.
    f. Approach the dock or mooring against the wind or current, whichever is strongest. In rough water, keep the bow of the boat into the wind, maintain sufficient throttle to control the boat, and get to shore as quickly as possible.
19. When refueling a boat:
    a. Stop the engine prior to refueling.
    b. Do not smoke while filling fuel tanks.
    c. Use a filler spout or a funnel to avoid gasoline spills.
    d. Secure all ignition sources until all vapors have been removed, either by natural or forced ventilation.

5.1 Towboats and Deckhands

1. Pilots must demonstrate the ability to safely operate towboats, which includes towing vessel proficiency and passing a practical documented skills test before assuming duties. A designated person qualified by training and experience will evaluate current marine pilots.
2. Pilots must demonstrate towing vessel proficiency to the evaluator to which they are assigned.
3. For pilot and deckhand training, the following applies:
    a. Sites using qualified deckhands and pilots to perform related work shall use certified subject matter experts (SMEs) for evaluations. Contact TVA Training for certification requirements.
    b. Individuals who maintain a United States Coast Guard Merchant Mariner Credential with a capacity of Master of Towing Vessels and Radar Observer shall be exempt from initial and annual evaluations.
    c. Upon completion of the necessary training by a certified SME, each deckhand shall work with a trained deckhand for a period to be determined by site management. Site management will determine when the individual is capable of performing deckhand duties and the individual will be re-evaluated by a certified SME before being released to perform deckhand work independently. The final evaluation shall be documented on TVA Form 17724 and recorded under LMS 00059230.
    d. Upon completion of the necessary training by a certified SME, each pilot shall work with a trained pilot for a period of time to be determined by site management. Site management will determine when that individual is capable of performing the skills associated with pilot duties, and the individual will be re-evaluated by a certified SME for that job. SMEs for pilots should be USCG licensed pilots. Completion of this final evaluation shall be completed on TVA Form 21304. The final evaluation for this initial training shall be recorded under LMS item 00059245, River and Deck Skills Initial for Pilots. Individuals who maintain a United States Coast Guard Merchant Mariner Credential with a capacity of Master of Towing Vessels and Radar Observer shall be exempt from initial and annual evaluations.
4. Each qualified deckhand and pilot must have a Marine Operations Performance evaluation annually unless exempt as outlined in #3.b above. This evaluation is to be completed by the supervisor to which they are assigned work status and/or a SME. This evaluation shall be recorded on TVA Form 17724 for deckhands and TVA Form 21304 for pilots must be kept on

file for no less than five years by the supervisor to which they are assigned work status. Evaluation Performance factors shall include:
    a. Each qualified deckhand Overall safety
    b. Job performance (boat and barge staging)
    c. Job knowledge
    d. Attitude, leadership and development recommendations
    e. Comments, signature, and date of the manager and employee
5. Be familiar with the characteristics of the vessel prior to independently operating.
6. Each vessel shall be equipped with at least two ring buoys with an attached 90-foot synthetic line. The ring buoys shall be located by the pilothouse and along the main deck forward and maintained in a serviceable condition.
7. All personal flotation devices shall be inspected before use.
8. Each personal flotation device shall be equipped with an Emergency/Life Preserver Flashing Light. This emergency light attaches to the personal life preserver and must be U.S. Coast Guard Approved. Each personal flotation device shall also be equipped with a pea-less whistle.
9. All TVA owned or leased towboats and barges shall undergo a comprehensive safety inspection quarterly to determine fitness for service. The inspection shall be documented on TVA Form 20966, Coal Operations Vessel Audit Report. A copy of the inspection report must remain on file with the facility manager responsible for yard operations or the yard operations supervisor and must remain on file for a period of not less than five years.
10. Any vessel that has undergone extensive modification, alteration, or repair that could potentially affect the safe operation of the vessel shall be re-inspected by a qualified technician prior to returning the vessel to service.
11. Perform a visual walk-down inspection at the beginning of each shift before movement commences. Check the following operational readiness items:
    a. Exterior condition
    b. List and draft
    c. Critical electrical and mechanical components responsible for powering and maneuvering the vessel
    d. Auxiliary and safety components which support vessel operation
    e. Obstructions to movement in water
12. Correct any deficiencies which could potentially affect the safe, efficient movement of a vessel before operation. If the vessel is unsafe to operate, place a defective equipment tag in the pilothouse on the vessel until the hazards are corrected. Deficiencies shall be corrected by a qualified technician.
13. Practice good housekeeping including keeping the deck clear of unnecessary equipment and foreign materials that may cause slip and trip hazards.
14. Maintain a non-slip surface on all outside decks.
15. Do not allow unauthorized personnel aboard vessels whether moored or underway without proper clearance from the site in charge of the vessel. Visitors shall always be accompanied by a crew member or other authorized personnel.
16. Promptly report any incidents such as suspected acts of sabotage, theft, fire, damage from collision or severe weather, or misconduct of employees to management. Incidents shall be investigated before operations continue.
17. Towboats will be equipped with a system that allows two-way communication between the pilot and deckhands.
18. The towboat will also have the capability of communicating with other marine craft and with personnel on shore in the event of an emergency.
19. Voice communication and a pea-less whistle or horn will be provided.
20. Use appropriate hand signals for communication between pilots and deckhands.
21. Ensure adequate lighting is in place for all operations.

22. Towboats shall have appropriate lights. At a minimum, the boat must have a red light on the port side of the pilot house, a green light on the starboard side of the pilot house, and two amber lights in a vertical line visible from the stern not less than two feet apart.
23. Conduct man overboard and rescue drills monthly for each crew/shift assigned to the vessel.
24. When any deckhand or pilot unintentionally enters the water, a complete investigation shall be conducted, and results documented. This requirement does not apply to drills.
25. Conduct fire drills involving the vessels, moored or underway, for each crew/shift assigned to the vessel monthly. All fire drill scenarios and responses shall be reviewed by the appropriate site management.
26. Fire extinguishers shall be ABC dry chemical type with a current inspection tag. Each engine room shall have adequate CO2 type extinguishers.
27. A first-aid kit shall be kept and maintained in the pilot house of each towboat for emergency use. It is the responsibility of the shift foreman to ensure the first-aid kit is adequately stocked.
28. The Operations Manager, or other person as assigned by the business unit, has responsibility for Marine Operations for Coal Operations.
29. The Operations Supervisor where marine operations are conducted is responsible for providing for safe operation of towboats and barges. This includes, but is not limited to:
    a. Selecting and assigning operators and deckhands
    b. Requesting physical examinations
    c. Providing required training and proficiency evaluation
    d. Providing for proper maintenance and upkeep of all marine equipment
    e. Ensuring that employee safety issues and concerns are solicited from employees and addressed in a timely manner.

6 Breathing Air Systems

6.1 Compressors

1. Determine and address sources of contaminants prior to use of compressor air.
2. Oil-free compressors are preferred.
3. Breathing air compressors shall be equipped with high temperature alarms or automatic shutdown systems and with warning devices to indicate loss of system air pressure.
4. Label compressors used for breathing air with signs indicating use for breathing air.
5. Use compressor oil suitable for use in breathing air applications.
6. Use of compressors equipped with breathing air purifier assemblies are preferred. Use breathing air purifier assemblies as designed and do not overload.
7. Use Grade D or better air with respirators. Never use pure oxygen gas in any part of the gas supply system supplying air supplied respirators.
8. Before starting and operating a compressor and purifier system, inspect all system components for structural damage that could result in an explosion. Inspect safety relief valves carefully and verify they are in good working order.
9. Locate the compressor intake at a location that allows intake of normal, uncontaminated ambient air. Ensure that contaminated air (i.e., exhaust from nearby vehicles or exhaust gases ventilated from plant operation) cannot enter the air-supply system.
10. Never operate the compressor intake point and intake hose in air contaminated with asbestos fibers. Locate the compressor and air intake hose in a clean air environment.
11. Ensure a continuous carbon monoxide monitor and alarm is installed and functioning in the compressor output breathing air stream before use.
12. Plumb exhaust lines on any internal combustion engine-driven compressor o a safe location.
13. Restrain air supply hose or lines every 15 feet of their length. This does not include the length of hose from the distribution manifold to the respirator.

14. Compressors shall be equipped with suitable in-line, air-purifying sorbent beds and filters to ensure breathing air quality and to minimize moisture content so that the dew point at one atmosphere pressure is 10 degrees F (5.56 degrees C) below the ambient temperature.
15. Follow manufacturer's recommendations for maintaining, replacement, or refurbishment of sorbent beds and filters. The most recent bed and filter change date and signature of the person performing the work are to be documented on a tag at the compressor.
16. For compressors that are not oil-lubricated, carbon monoxide levels are not to exceed 10 ppm. This requirement can be met by the use of continuous carbon monoxide alarms, carbon monoxide sorbent materials, an air intake location free of contaminants, frequent monitoring of air quality or the use of high-temperature alarms and automatic shutoff devices.
17. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only a high-temperature alarm is used, the air from the compressor must be tested for carbon monoxide at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.
18. Breathing air couplings must be incompatible with outlets for non-respirable plant air or other gas systems.

6.2 Compressor Testing

1. Conduct semi-annual air quality tests to ensure breathing air quality standards are met.
2. Perform air quality tests anytime compressor maintenance is performed.
3. Post last air quality test on compressor or maintain documentation for review.
4. Maintain records on breathing air testing for a period of at least 12 months in accordance with site documentation retention protocol.

6.3 Compressed Gas Cylinders

1. Supplier of air cylinders used for breathing air must provide certificate of analysis meeting Grad D or better air in accordance with Compressed Gas Association G-7.1.
2. Cylinders must be tested and maintained in accordance with manufacturer or supplier recommendations.
3. The moisture content of the compressed air cannot exceed a dew point of -50 degrees F (-45.6 degrees C) at one atmosphere pressure.
4. Cylinders used for breathing air shall be marked in accordance with the NIOSH respirator certification standards.

7 Chemicals and Contaminants (Hazard Communication/HAZCOM)

1. TVA complies with OSHA Hazard Communication requirements through TVA-TSP-18.917, Hazard Communication. This section outlines basic safety requirements for chemical use.
2. Use of certain chemicals or exposure to certain contaminants may require an exposure assessment or other industrial hygiene considerations. Contact TVA Safety for assistance.
3. Label containers of hazardous chemicals with the identity of the material and appropriate hazard warnings. Blank labels and pictograms may be accessed at: GHS Labels and Pictogram.pptx (sharepoint.com)
4. Signs, placards, operating instructions, or other plant instructions may be used in lieu of affixing labels to plant process equipment (pipes, tanks, pumps, and stationary containers of like materials in an immediate area, etc.).
5. NPG labels for chemicals and hazardous materials must meet the NPG Chemical Traffic Control specifications.
6. Labeling is not required for portable secondary containers when chemicals are transferred from labeled containers and are intended only for the immediate use of the employee who performs the transfer and are used during a single 8-hour shift.

7. Labels must be legible, in English, and prominently displayed.
8. Do not remove or deface labels on containers of hazardous chemicals.
9. Reference the Safety Data Sheet before using chemicals to understand the hazards associated with the chemical, the proper PPE needed, the proper use and application and the any other special considerations before use. Do not use a hazardous chemical for which an SDS is not available.
10. SDS sheets may be accessed via the Safety SharePoint site. The link to TVA's Safety Data Sheet database is Hazard Communications & Safety Data Sheets (sharepoint.com)
11. Sites must maintain a chemical inventory list. Prior to ordering or purchasing any chemical, employees must verify that the chemical is listed on the facility's inventory.
12. Partners/contractors shall obtain approval for any chemicals brought on site to perform work.
13. Partners/contractors shall provide an SDS and a complete list of any hazardous chemicals that they will be using to the TVA site/facility hazard communication program coordinator.

7.1 Arsenic

Arsenic is a highly toxic substance that is absorbed into the body by inhalation and ingestion. All work processes that produce arsenic must be conducted in accordance with TVA-TSP-18.902, Arsenic.

7.2 Asbestos

1. All work shall be conducted in accordance with TVA-TSP-18.903, Asbestos Management and Exposure Control.
2. Asbestos may be present in the workplace in many forms, including but not limited to:
    a. Insulation such as pipe, duct, boiler wall, electrical cable insulation and arc chutes.
    b. Building materials such as transite board, ceiling and floor tile, roofing materials, acoustic and fireproofing insulation.
    c. Mechanical products including brake shoes, clutch lining valve packing and gasket material.
3. Treat all materials as suspect asbestos containing material until determined otherwise.
4. All asbestos containing materials shall be removed by appropriately trained personnel. If any material is found to be suspect or containing asbestos, stop work immediately and notify your Supervisor. Barricade any areas where suspected asbestos material is found until the material can be properly removed.
5. Employees or individuals who observe suspect material (e.g. fallen pipe insulation) shall immediately stop work, leave the area, and notify their supervisor of the location(s) and nature of the problem.

7.3 Cadmium

1. For work involving potential exposure to cadmium, review the scope of work and/or a review of safety data sheets (SDS), historic plant records, and/or sampling records.
2. When data exists to demonstrate employee exposure to be below 2.5 μg/m3, employee exposure monitoring is not required.
3. When data is not available, exposure monitoring is necessary, and TVA Safety shall be contacted to arrange Industrial Hygiene Services and determine the need for a written compliance plan. engineering and administrative controls and medical examinations
4. Work areas must have barricades and controlled access points with appropriate signage for the hazards.

7.4 Carbon Monoxide (CO)

Use of fuel powered equipment indoors or in or adjacent to enclosed spaces poses the risk of carbon monoxide poisoning to workers in the area. The following requirements apply when such equipment must be indoors or in enclosed spaces.

1. Use well-maintained equipment with engines that are properly tuned.
2. Locate gasoline engines away from air intakes.
3. Use additional ventilation as needed to maintain good air flow in areas where CO potential exists.
4. When running a fuel powered engine in an area where personnel are working in an enclosed area, such as a truck engine running on a deck with workers in a vault below or a truck running near breaker/transformer hatch doors, be aware that CO can accumulate in the enclosed area. Take precautions such as shutting off the engine or using forced ventilation and using CO monitors while the work is being performed.
5. Consider the use of tools powered by electricity when available and appropriate for the work to be performed.
6. Use personal and/or area CO monitors with audible alarms where potential sources of CO exist.
7. Understand the symptoms of CO poisoning/overexposure: headache, nausea, weakness, dizziness, visual disturbances, changes in personality, and loss of consciousness.

7.5 Caustics (Bulk)

1. Employees shall be knowledgeable in safety precautions and handling of caustics.
2. Avoid exposure to caustic vapors.
3. Transfer operations shall have a Job Safety Analysis (JSA).
4. Post DANGER - CAUSTIC UNLOADING IN PROGRESS signs in the transfer area. Nonessential employees are prohibited within 20 feet of the transfer area.
5. Do not perform or allow welding, cutting, and other flame or heat-producing operations/activities in the transfer area.
6. Use the following minimum safety equipment for transfer operations:
    a. Face shield with chemical goggles
    b. Rubber gloves and rubber boots
    c. Protective rubber aprons or acid-proof clothing
7. Face shields shall be worn during venting operations or breaking pipe connections
8. Ensure an emergency shower and eyewash is nearby, operational and tested prior to transfer.
9. Ensure wash down capability is available in the immediate transfer area for diluting liquid spills.
10. Cease transfer operations if:
    a. A leak occurs. In this event, close the valve, depressurize line, and drain before tightening or loosening connection.
    b. Vendor truck attendant leaves the transfer area. In this event, stop operations and do not resume until attendant returns.
11. Prohibited operations include:
    a. Making or breaking connections while system is under pressure or contains liquid.
    b. Nighttime transfers unless operational areas are well lit.
12. Flex hoses used in transfer operations shall be:
    a. Designed and identified TO BE USED FOR CAUSTICS ONLY
    b. Have a manufacturer's rating of at least 50 psi and marked with pressure rating
    c. Hydrostatically tested annually with documented results
13. All fittings and couplings required to adapt the flexible discharge hose from the unloading vessel to receiving vessel shall be made of iron, nickel, or nickel iron, rated at a minimum of 50 psi with a 4:1 safety factor, and identified for CAUSTIC ONLY.
14. Do not allow copper, brass, bronze, or aluminum in valves or fittings to contact caustic solutions.

15. If freezing is suspected, open the manhole located on top of the vessel and thrust a rod down to the bottom of the vessel. A “feel” of the bottom will indicate whether crystallization has taken place. In the event crystallization has occurred, secure the system and do not attempt transfer.
16. Transfer liquid caustic solutions received by tank truck by using either a pressure or pump transfer mode.
17. When compressed air is selected, either operation below is acceptable.
    a. Plant air supply through an industrial-type hose, rubber-lined, having 100-psig rating. The plant air line is provided with a regulating-type, pressure-reducing valve set at not more than 20 psig; a safety valve set at 25 psig; a rupture disc set at 32 psig; a pressure gauge; and a bleed valve to bleed line pressure.
    b. Tank truck’s air compressor using no more than 20-psig pressure. The safety relief valve operates at no more than 25 psig.
18. In the absence of a specific site procedure, follow these steps for transfer using air supply:
    a. Ensure driver engages the brake and the rear wheels are chocked.
    b. Clear the transfer area of nonessential employees and display the appropriate DANGER signs.
    c. Ensure essential employees are wearing applicable protective clothing.
    d. Vent the truck vessel. Stay clear of vent line until vessel is depressurized.
    e. The driver shall open the truck’s vent valve and depressurize the truck vessel in preparation for sampling and connecting the truck to the receiving vessel.
    f. When the plant-sampling crew is ready, the driver shall open the dome carefully and a sample shall be taken for analysis. The Driver shall close the dome.
    g. Set up the plant receiving system. Verify the plant’s unloading valve is in the closed position, if applicable. Remove the dust plug or cap from the unloading connection.
    h. Connect the flex hose between the truck vessel and plant receiving system. This connector should be independently verified as correct.
    i. Ensure that the transfer hose is marked for caustic liquid.
    j. Slowly open the plant’s air supply line and purge the line of moisture. Lift the lever on the system relief valve to ensure it is operable. Connect the supply line to the trailer's air supply system, if applicable.
    k. Check the plant’s receiving systems. Verify all receiving valves are closed to prevent inadvertent mixing of acid and caustics. Verify that the receiving vessel is at ambient pressure and the vent valve is open.
    p. Verify that sample results are acceptable.
    q. Begin the liquid transfer from the truck to the plant’s receiving vessel at ambient pressure.
    r. Observe the system for leaks prior to and during each valve opening.
    l. Slowly open the plant’s receiving valve.
    m. Slowly open the trailer’s unloading valve.
    n. If leaks are detected, tighten connections before pressure is added. Establish integrity of the system while at ambient pressure.
    o. With the plant’s air supply valve, slowly increase truck vessel pressure so not to exceed 20 psig.
    p. Check the transfer system for leaks.
    q. With the truck vessel unloaded, close off the plant receiving valve and close the plant air supply valve. Vent air line or open truck vessel’s vent valve to depressurize the truck vessel and the air line.
    r. Disconnect flex hose from the trailer vessel.
    s. Disconnect the plant’s air supply line from the truck.
    t. Wash down the transfer area.
    u. Disconnect the flex hose from the plant receiving system, flush the line, and replace the dust plug or cap over unloading connection.

19. If contact with a caustic solution occurs, irrigate the eyes with water for at least 15 minutes. Wash any caustic contaminated areas of body with soap and water. Notify medical personnel immediately.
20. An equipment storage cabinet shall be located near any caustic storage tank. The cabinet shall contain the following equipment as a minimum:
    a. Two “DANGER - CAUSTIC UNLOADING IN PROGRESS” signs
    b. Four chocks for truck
    c. Four pair of rubber gloves
    d. Two face shields
    e. Two pair of chemical goggles
    f. Two sets of caustic-proof clothing, or two rubber aprons
    g. Two pair of rubber boots
    h. One 50-foot water hose for wash down
    i. Roll of “DANGER - KEEP OUT" barricade tape

7.6 Cryogenic Materials including Dry Ice

1. Understand the hazards of cryogenic equipment and materials before beginning work. Some hazards include extremely low temperatures, high pressures and the development of very high or very low concentrations of oxygen.
2. Understand the impact of cryogenic materials on tools and equipment. For example, extreme cold of liquid nitrogen can make metals and other materials, including tools, brittle.
3. Prevent the release of significant volumes of liquid nitrogen.
4. Uninsulated equipment can condense oxygen from the air and result in dangerously high concentrations of liquid oxygen which can be explosive.
5. Ensure adequate ventilation and either periodic or continuous oxygen monitoring are in place before working with liquid nitrogen.
6. Protect against contact with cold surfaces.
7. Personal protective equipment (PPE) includes goggles, face shield, aprons, and insulated gloves that fit loosely enough to permit quick removal in case of a spill. There shall be no exposed skin.
8. Do not wear jewelry or clothing with cuffs or pockets that could trap and hold cryogenic liquid.
9. Do not drop warm solids or liquids into cryogenic liquids.
10. Place objects into a cryogenic liquid very slowly.
11. Pour cryogenic liquids slowly to minimize the inevitable boiling and splashing.
12. Avoid pouring cold liquid over the edge of a Dewar flask to prevent breakage or an implosion.
13. Dewar flasks and cold taps containing cryogenic materials shall be taped in case the glass breaks. This will prevent flying glass.
14. Avoid breathing vapor from any cryogenic liquid source (except for liquid oxygen equipment designed to supply warm breathable oxygen).
15. When discharging cryogenic liquids from drain valves or blow down lines, open valves slowly to prevent splashing.
16. If contact occurs:
    a. Flush damaged tissue with a gentle stream of warm water or from an eyewash/shower station.
    b. Use warm water to free skin that has frozen together.
    c. Dry affected area very gently (excluding the eyes) and keep protected. Seek medical treatment immediately.
17. Dry ice shall be handled following precautions similar to cryogenic liquids.
18. Always add dry ice to liquid very slowly and in small amounts to avoid foaming and boil over.
19. Handle dry ice with dry leather or insulated gloves.
20. Never put your head into an ice chest or other container containing dry ice since the oxygen level may be near zero and almost immediate unconsciousness may result.

7.7 Hexavalent Chromium

Certain welding operations may result in harmful exposures to hexavalent chromium. Those operations must be conducted in accordance with TVA-TSP-18.915 , Hexavalent Chromium.

7.8 Lead

Employees may encounter lead by contacting products that contain the substance or are coated with lead-bearing compounds. All work processes that may cause exposure to lead must be conducted in accordance with TVA-TSP-18.909, Lead.

7.9 Mercury

1. Mercury compounds, particularly the salts, may injure the eyes upon contact.
2. Mercury combines with many metals and may cause serious damage in metal systems. Among the metals that mercury combines with are zinc, copper, lead, tin, silver, gold, platinum, cadmium, aluminum, bismuth, sodium, and potassium.
3. Mercury and some compounds of mercury will form explosive compounds with acetylene, in the presence of ammonia, or with mixtures of nitric acid and ethyl alcohol (e.g., denatured alcohol or Solox). Chlorine dioxide and liquid mercury explode violently.
4. Mercury batteries and anode cells may explode if exposed to fire or when short-circuited.
5. Mercury vapor can be generated from metallic mercury if spills are not cleaned up immediately. Every effort must be made to contain or control the vapor.
6. Attention shall be given to mercury systems which are to be heated or pressurized.
7. In locations such as the mercury storage room where mercury is routinely handled and potential for exposure exists, periodic air sampling shall be performed to ensure that levels do not exceed the threshold limit value of .05 mg/m^3 in air of vapor, mists, fumes, or dusts.
8. Keep mercury containers tightly closed when not in use. Use containers made of stainless steel or plastic.
9. Clearly label mercury containers as follows: MERCURY. Warning! Vapor Harmful. Do not breathe vapor or get liquid on skin.
10. Clearly label containers of mercury compounds with the name of the compound followed by: MERCURY. Warning! Toxic if inhaled, swallowed, or left on skin.
11. Store mercury and its compounds in a cool, well-ventilated location remote from heat, fire hazards, ammonia, and acids.
12. Do not store mercury near floor drains which empty directly to sewer systems unless provisions are made to contain the total quantity of mercury if spilled.
13. Do not store mercury and mercury systems where they will contaminate workroom atmospheres.
14. Ensure adequate local exhaust enclosures are provided on systems which might generate vapors, mists, or dust of mercury or its compounds.
15. Ventilation shall be provided in workrooms housing mercury systems. Room air supply grilles shall be arranged to provide positive fresh air movement to work benches and work areas where mercury is normally handled or is likely to be spilled.
16. When possible, perform operations which might generate vapor, mists, or dusts (cleaning heating, brushing, grinding, welding, soldering, etc.) under a laboratory hood with a fully open average face velocity of no less than 100 feet per minute or with a flexible exhaust pickup as near as possible to the source. If the task cannot be moved to a location where exhaust control can be applied, all workers entering the area shall wear respiratory and skin protection.
17. Use a fume hood to collect vapors when mercury or mercury compounds are heated in a manner to release vapors to the atmosphere.
18. Transfer mercury or clothing contaminated with mercury in total containment systems or under adequate laboratory hoods.
19. Use a plastic funnel when pouring mercury into containers.
20. When transferring mercury, always transfer over spill trays.

21. Place stainless steel or high-impact plastic spill trays under all mercury systems and operations which have a potential to break or spill. The tray area and the rim height shall be sufficient to capture and contain all spills.
22. Do not allow mercury to stand in spill trays. Collect the mercury immediately after spills occur. Water may be kept in spill trays to suppress the escape of vapors from spilled mercury.
23. The floors and lower walls in rooms where mercury is used should be smooth, well sealed, free of cracks, and nonporous. Rooms with wooden floors shall not be used for mercury operations. If large amounts of mercury are routinely handled, the floor should slope toward a mercury sump where mercury can be collected under water and recovered.
24. Benches and tabletops where mercury is handled should be made of a nonporous, crack-free material, which will not retain spilled mercury droplets after decontamination. Otherwise, spill trays shall be placed under the work to prevent contamination of the workbench or table.
25. Manometers and other such mercury systems shall be equipped with traps and check valves, or both, to prevent blowout.
26. Where possible, transparent plastic shields shall be used in front of manometers and other mercury systems as a preventive measure against accidental breakage.
27. Do not dispose of any amount of mercury or its compounds by dumping into any system which may eventually empty into the public watershed or water supplies.
28. Never put metallic mercury into sewer or sink drains.
29. Vacuum pumps serving mercury systems shall be equipped with trapping or filtering systems adequate to capture mercury vapors and droplets, which might otherwise be released to the atmosphere in the pump discharge.
30. Do not take food, drinks, tobacco products, pipes, or eating and drinking utensils in areas where mercury contamination may occur.
31. Wear impervious gloves while doing tasks which may contaminate the hands with mercury or its compounds.
32. Wear a face shield and/or chemical splash goggles when handling mercury compounds if mercury mists or droplets may be generated.
33. Wear protective clothing, such as aprons, impervious gloves, and rubber boots, to prevent skin exposure to mercury and its compounds. If coveralls are needed, they shall not have cuffs and shall fit closely around the writs, ankles, and neck.
34. Wash hands before eating, drinking, or smoking. Contaminated cigarettes or smoking with contaminated hands can result in particularly high and dangerous inhalation exposures. The hands shall be thoroughly washed at the end of each task involving the handling of mercury or its compounds even if gloves are worn.
35. Persons who handle mercury should rinse their mouth several times before lunch and breaks and at the end of the shift.
36. Check clothing for mercury following a spill or blow out since mercury can be accidentally deposited in cuffs, folds, and interstices of the clothing. If clothing is contaminated, shower and change to clean clothes. Place contaminated clothing in an impervious bag and contact TVA Environmental for disposal requirements.
37. Where possible, equipment, apparatus, glassware, and other items contaminated with mercury shall be decontaminated or sealed in rugged, airtight containers and clearly labeled as contaminated and stored in a location where personnel will not be exposed.
38. Remove rings and other forms of jewelry which may be damaged before working with mercury.
39. Wear approved respiratory protective devices for protection against mercury, vapors, mists, and dust. Ensure that cartridges and filters are fresh and that the respirator masks are properly fitted.

7.9.1 Emergency Procedures for Mercury

1. When a mercury spill or release of less than a pound occurs, follow the guidelines in Section 7.9.2 of this manual.
2. For spills or releases over a pound, the following guidelines shall be followed:

   a. At generating locations, contact the shift supervisor or supervisor/person in charge immediately who in turn shall notify the Hazmat Team.
   b. If the spill is in an area controlled by Transmission, the Transmission Service Manager over that area shall be contacted.
   c. Restrict the area of the spill and prohibit unprotected employees from the area until decontamination is complete.
   d. Use qualified hazmat teams or vendors for clean up.
3. When a spill has occurred, be prepared to give the following information to the responsible supervisor.
   a. The approximate amount of mercury spilled and when it occurred.
   b. The location of the spill.
   c. Approximate temperature of the surfaces and atmosphere where the spill occurred.
   d. The presence and location of heat sources.
   e. The presence of floor drains.
   f. Status of decontamination operations.
   g. The names of persons who might have been exposed to mercury.
   h. The number of persons working in the area.
4. If spills are less than one pound, the responsible supervisor will call the safety representative to arrange for air monitoring before clean up begins.
5. The Hazmat team shall wear respiratory protection against mercury, vapor, mist, and dust. They shall wear impervious gloves, boots, and coveralls and additional protective clothing deemed necessary. If needed, they shall wear impervious boots and goggles or a face shield. Leather-soled shoes shall not be worn for major decontamination tasks unless covered by impervious boots.
6. The shift supervisor will contact the Hazmat team, environmental staff, and safety staff.
7. Contaminated clothing shall not be worn outside the restricted area. Mercury barrier creams may be used for supplemental protection of exposed skin area.
8. All possible spill material shall be vacuumed up with a Mer-Vac or equivalent vacuum cleaner.
9. After all possible liquid mercury has been vacuumed; the surface shall be treated with the mercury spill kit. Manufacturer's directions must be followed.
10. Contaminated rags, mops, vacuum cleaner cartridges, etc., shall be sealed in impervious containers and placed in a waste receptacle exclusively reserved and labeled for mercury waste and turned over to the plant environmental staff or disposal.
11. Equipment necessary for a mercury spill is as follows:
    a. Latex or Rubber Gloves
    b. Tweezers
    c. Goggles
    d. Damp Paper Towels
    e. Rubber Squeegee
    f. Plastic Dustpan
    g. Plastic Trash Bags
    h. Zipper-Shut Plastic Bags
    i. Flashlight
    j. Wide-Mouth Plastic Container with Screw on Lid
    k. Large Tray or Box
    l. Eye Dropper or other Suction Device such as a Turkey Baster
    m. Sulfur Powder
    n. Tape - Electrical or Duct Tape
    o. Mercury Vapor Analyzer if available
    p. Tyvek
    q. Rubber Gloves and Rubber Boots
    r. Respiratory Protection - If spill is one pound or less, a Full-Face APR may be used with cartridge approved for mercury vapor

s. Mercury Spill Kit
t. Approved Mercury Vacuum

12. Never use an ordinary vacuum or shop vac to clean up mercury, vacuuming mercury will blow vapors into the area and thereby increase the likelihood of human exposure.
13. Never use a broom or a paintbrush to clean up mercury. It will break the mercury into smaller beads and further scatter the mercury.
14. Never use household cleaning products, especially those containing chlorine or ammonia, because they may react violently with the mercury and release other toxic gases.
15. Never put mercury in the trash.
16. Contact site environmental for disposal of mercury or contaminated equipment.

7.9.2 Mercury Spill Information and Clean-up Guidance for less than one pound (approximately 2 tablespoons) of Mercury

1. Immediately barricade the mercury spill to prevent spread. Any employees that were in the incident area shall inspect shoes and clothing for visible signs of mercury beads. If mercury is visible on clothing or shoes, they shall be removed and collected for laundering or disposal. Beads can be removed by utilizing a medicine dropper or turkey baster.
2. Keep the area as cool and well ventilated as possible to minimize mercury evaporation. Close all heating and air conditioning vents in the area until the cleanup is finished. If vents cannot be closed, turn off central ventilating or air conditioning systems that could circulate air from the spill area to other adjacent areas.
3. Close all doors to area (if applicable). If weather permits, open any exterior doors and windows. Use of a fan or air horn is recommended to ventilate the area to the outside.
4. Utilize a flashlight to look for beads of mercury. The light will reflect from the mercury beads. Shine light at different angles.
5. If possible, try to contain the mercury spill to prevent it from entering drains, cracks, or other porous surfaces.
6. If the spill involves broken glass, such as a thermometer or a glass ampoule from a thermostat, use tweezers to safely pick up any broken glass and place it in the plastic container.
7. Try to work from the outer perimeter of the spill towards the center by pushing mercury beads together using a card, still paper, or squeegee. Mercury beads roll very quickly, so be careful not to be too aggressive trying to collect it. The beads can be pushed into a plastic dustpan or use an eyedropper or turkey baster to pick up the beads. If you use this method, hold the suction device parallel with the floor to collect the beads since it is not strong enough to pick up the
   s. dense bead. Tape can also be utilized to pick up smaller beads of mercury for harder to reach areas. All mercury shall be collected in a plastic container with a lid.
8. Once all easily visible droplets are removed, utilize the flashlight as described before.
9. An optional step is to sprinkle sulfur powder on the spill area after cleaning up the beads. A color change from yellow to brown will indicate that mercury is still present and more clean up is needed. If the sulfur powder stays yellow, you may stop clean-up efforts. A special vacuum cleaner designed for hazardous waste may also be used.
10. Once the area has been cleaned, if mercury is trapped in cracks or crevices and cannot be removed, an epoxy may be used to seal the hard concrete surface to encapsulate the mercury and prevent vapor release.

7.10 Silica

1. Certain tasks may produce harmful levels of silica. When tasks which could cause silica exposure, they must be conducted in accordance with TVA-TSP-18.913, Silica.
2. The list below is not all inclusive but provides examples of tasks that may be subject to the procedure.
   a. Operating and maintaining limestone processes
   b. Chipping, hammering, or mixing of boiler refractory

c. Chipping, hammering, or drilling or crushing of rock
d. Abrasive blasting using silica sand as the abrasive medium
e. Abrasive blasting of concrete regardless of the abrasive medium
f. Sawing, hammering, drilling, grinding, or chipping of concrete or masonry products
g. Chipping, hammering, or mixing of concrete grout
h. Demolition of concrete or masonry structures
i. Dry sweeping or compressed air blowing of concrete, masonry, rock, or sand dust
j. Welding, cutting, grinding, on boiler tubes coated with fly ash or refractory slag
k. Work in and around precipitators and bag houses which would include inspections
l. Work in and around crusher buildings and bunker rooms which would include inspections
m. Work manipulating or moving limestone materials in parking lots, substations, etc.

7.11 Sulfuric Acid (Bulk)

1. Understand safety precautions necessary for handling of sulfuric acid. Reference the SDS sheet before work begins.
2. Transfer operations shall have a Job Safety Analysis (JSA) developed.
3. Post DANGER - ACID UNLOADING IN PROGRESS signs in the transfer area. Nonessential employees are prohibited within 20 feet of the transfer area.
4. Never weld, cut, or perform other flame or heat-producing activities in the transfer area.
5. Use the following minimum safety equipment for transfer operations:
    a. Face shield with chemical goggles
    b. Rubber gloves and rubber boots
    c. Protective rubber aprons or acid-proof clothing
6. Wear face shields or acid hoods during venting operations or breaking pipe connections
7. Check to ensure the emergency shower and eyewash is operational prior to transfer.
8. Ensure wash down capability is available in the immediate transfer area for diluting liquid spills.
9. Stop transfer operations if:
    a. A leak occurs. In this event, close the valve, depressurize line, and drain before tightening or loosening connection.
    b. Vendor truck attendant leaves the transfer area. In this event, stop operations and only resume when attendant returns.
10. Do not make or break connections while the system is under pressure or contains liquid.
11. Do not perform nighttime transfers unless operational areas are well lit.
12. Flex hoses used in transfer operations shall be:
    a. Designed and identified TO BE USED FOR ACIDS ONLY
    b. Have a manufacturer's rating of at least 50 psi and marked with pressure rating
    c. Hydrostatically tested annually with documented results
13. All fittings, couplings, adapters, and disconnects required to adapt the flexible discharge hose from the unloading vessel to receiving vessel shall be made of 316 stainless. They are rated at least 50 psi with a 4:1 safety factor and are identified for ACID ONLY. Do not use cast iron.
14. Quick couples, adapters, o-rings, and gaskets will be designed for sulfuric acid use.
15. All hand tools used for making or breaking pipe connections and fittings/couplings shall be made of spark-proof material, preferably bronze.
16. When compressed air is selected, either of the following operations are acceptable:
    a. Plant air supply through an industrial-type hose, rubber-lined, having 100-psig rating. The plant air line is provided with a regulating-type, pressure-reducing valve set at not more than 20 psig; a safety valve set at 25 psig; a rupture disc set at 32 psig; a pressure gauge; and a bleed valve to bleed line pressure.
    b. Tank truck's air compressor using no more than 20-psig pressure. The safety relief valve operates at no more than 25 psig.

17. In the absence of a specific site procedure, follow these steps for transfer using air supply:
    a. When truck is in unloading position, ensure driver engages the brake and the rear wheels are chocked.
    b. Clear the transfer area of nonessential employees and display the appropriate DANGER signs. Ensure essential employees are wearing required PPE.
    c. Vent the truck. Stay clear of vent line until vessel is depressurized.
    d. The driver shall open the truck's vent valve and depressurize the truck vessel in preparation for sampling and connecting the truck to the receiving vessel.
    e. When the plant-sampling crew is ready, the driver shall open the dome carefully and a sample taken for analysis. The Driver shall close the dome.
    f. Set up the plant receiving system. Verify the plant's unloading valve is in the closed position, if applicable. Cautiously remove the dust plug/cap.
    g. Connect the flex hose between the truck vessel and plant receiving system. This connector should be independently verified as correct.
    h. Ensure that the transfer hose is marked for sulfuric acid.
    i. Slowly open the plant's air supply line and purge the line of moisture. Lift the lever on the system relief valve to ensure it is operative. Connect the supply line to the trailer's air supply system, if applicable.
    j. Check the plant's receiving systems. Verify all receiving valves are closed to prevent inadvertent mixing of acid. Verify that the receiving vessel is at ambient pressure and the vent valve is open.
    k. Verify that sample results are acceptable.
    l. Begin the liquid transfer from the truck to the plant's receiving vessel at ambient pressure.
    m. Observe the system for leaks prior to and during each valve opening.
    n. Slowly open the plant's receiving valve.
    o. Slowly open the trailer's unloading valve.
    p. If leaks are detected, tighten connections before pressure is added. Establish integrity of the system while at ambient pressure.
    q. With the plant's air supply valve, slowly increase truck vessel pressure. Do not exceed 20 psig.
    r. Check the transfer system for leaks.
    s. With the truck vessel unloaded, close off the plant receiving valve and close the plant air supply valve. Vent air line or open truck vessel's vent valve to depressurize the truck vessel and the air line.
    t. Disconnect flex hose from the trailer vessel.
    u. Disconnect the plant's air supply line from the truck.
    v. Wash down the transfer area.
    w. Disconnect the flex hose from the plant receiving system, flush the line, and replace the dust plug or cap over unloading connection.
18. If contact with acid occurs, irrigate the eyes with water for at least 15 minutes. Wash any sulfuric acid contaminated areas of the body with soap and water. Notify medical personnel immediately.
19. An equipment storage cabinet shall be located near any sulfuric acid storage tank. This cabinet shall contain the following equipment as a minimum:
    a. Two "DANGER - ACID UNLOADING IN PROGRESS" signs
    b. Four chocks for truck
    c. Four pair of rubber gloves
    d. Two face shields
    e. Two pair of chemical goggles
    f. Two sets of acid-proof clothing, or two rubber aprons
    g. Two pair of rubber boots
    h. One 50-foot water hose for wash down

i. Roll of ‘DANGER - KEEP OUT" barricade tape

8 Clearances/Lockout Tagout

1. All work requiring energy to be isolated to protect personnel must be performed in accordance with TVA-TSP-18.613 where a clearance and tagging process is to be used or TVA-TSP-18.615 where a lockout process is to be used. Business Units may have specific procedures for energy isolation and in that case, the business unit procedure shall be followed.
2. Review the scope of work to determine the isolation points necessary to protect personnel.
3. Isolate energized equipment from all sources of energy before beginning work. Energy sources include but are not limited to: electrical, chemical, mechanical, pneumatic, fluid and gas, hydraulic, thermal, pressurized water, and gravity.
4. Verify correct unit, equipment or component, and absence of energy before beginning work.
5. If any discrepancies are discovered related to energy isolation, immediately contact Operations or the LOTO Administrator.

9 Color Coding/Inspections of Material and Equipment

1. Annual safety inspections of material and equipment will be color coded in accordance with the schedule below to signify that the material/equipment passed the required inspection. The color code applied at the time of the inspection serves as the record of inspection.

Inspection Year Color Codes	
Year	**Color**
2021	Red
2022	Green
2023	Blue
2024	Red
2025	Green

2. When applying the color code, remove any paint, tape or tie wraps from prior years. If removal of paint is not possible, cover or conceal the prior year(s) in order to avoid an error likely situation from two colors of paint present.
3. The color code can be applied by means of color tape, paint, colored tie wraps, etc.
4. Inspections shall occur at least every 365 days. Organizations shall either mark the inspection date on the color code, document the inspection date on a written record or in a system such as Maximo. This record shall be retained and available for review until the next inspection occurs.
5. The method used to apply the color code shall be durable for the intended use of the material or equipment.
6. Organizations may elect to include the year of inspection with the color code. Inclusion of the year prevents an item that has not been inspected for a three-year period appearing to have a current year inspection.
7. The color cycle repeats itself every three years and shall be followed in sequence for additional inspections.

10 Combustible Dust

1. TVA-TSP-18.1205, Combustible Dust shall be referenced for specific requirements related to TVA’s combustible dust program.
2. Conduct work in a way that minimizes the release of combustible dust.
3. Report equipment problems, personnel hazards, and other deficiencies to your supervisor/foreman when conditions cannot be immediately corrected.

4. Combustible dust accumulations shall be maintained ≤1/32 inch on all surfaces (e.g. the floor, overhead beams, joists, ducts, vertical surfaces, and the top of equipment).
5. If combustibility of dust is in question, Plants/Facilities shall conduct testing.
6. All Plants/Facilities with combustible dust hazards shall have a written program which outlines plans for controlling combustible dust accumulations.
7. Personal Protective Equipment shall be provided in areas where combustible dust accumulations are not controlled to 1/32 of an inch and the potential for flash fire exists.

11 Compressed Air

1. Using compressed air during certain circumstances may be prohibited by other TVA procedures. Consult the appropriate procedure for the work being performed.
2. When using compressed air used for cleaning, limit psi to 30-psi at the nozzle, except for compressed air used with an air lance.
3. Before operating an air hose, examine all connections to make sure they are tight and will not come loose under pressure. Hold the nozzle when turning air off and on
4. Safety pins are required with Chicago couplings to assure that the line is secure.
5. In construction applications, if an air hose is more than 1/2-inch in diameter, ensure a safety excess flow valve is installed at the source of the air supply to reduce pressure in case of hose failure.
6. When using pneumatic drills, the drill guide plate shall be in place when drilling into hard surfaces such as granite or concrete.
7. Do not kink the air hose to stop the airflow. Always turn off at the control valve.
8. Inspect the air hose carefully to make sure it is in good condition before opening the valve to let air into the hose.
9. Keep air hoses out of aisle ways.
10. Never point a compressed air hose nozzle at any part of your body or at another person.
11. Never use compressed air for a practical joke.
12. Use goggles, foot shields, and ear protection when operating an air hammer. Face shields are necessary for certain tasks such as breaking up concrete. Refer to the Eye and Face Protection section of this manual or the manufacturer's instructions for guidance in selecting the proper personal protective equipment.
13. Before turning on the air pressure, make sure that dirt and debris from the machinery being cleaned will not be blown onto other workers.
14. Ensure the operator and any other workers who must be in the immediate cleaning area are wearing eye protection and other necessary personal protective equipment.
15. Observe warning signs about compressed air lines and locations. Permanent compressed air lines shall be appropriately labeled and colored.
16. Never lift air tools by the hose.
17. Before using an air tool, make sure it is in good repair and properly attached. Make sure that the pressure rating for the tool is not exceeded.
18. Pneumatic tools used on energized equipment or where energized equipment may be contacted shall have protection against accumulation of moisture.
19. When changing parts:
    a. Turn the air off,
    b. Disconnect the tool, and
    c. Bleed the line.
20. Do not substitute any other gas, such as oxygen, for compressed air.
21. Make sure any compressed air equipment is maintained on a regular basis. Compressed air equipment must be repaired by qualified personnel.
22. Ensure safety clips or retainers are securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

12 Compressed Gases

1. The requirements in this section do not apply to small calibration gas cylinders or breathing air cylinders. Those cylinders shall be used, handled and stored in accordance with manufacturer instructions.
2. Do not mix gases in cylinders. No person, other than the gas supplier, shall mix gases in cylinders.
3. There are requirements for the maximum amount of gases that may be stored in a control area. Contact TVA Safety for guidance.
4. Refilling cylinders is restricted to the owner/gas supplier of the cylinder or authorized agent unless the cylinder is for SCBA use. Trained/Qualified individuals may refill SCBA cylinders from provided compressed breathing air cascade manifolds.
5. Do not tamper with or bypass safety devices for cylinders and/or valves.
6. Keep stored cylinders well away from combustible materials, open flames, or other sources of ignition.
7. Keep cylinder rooms and fenced areas locked to prevent tampering.
8. Do not expose cylinder to temperature extremes, excessive dampness, or to corrosive chemicals or fumes.
9. Do not permit flames to contact the surface of a cylinder.
10. Do not transfer gases from one vessel to another (except dry ice and cryogenic material).
11. Use piping and fittings suitable for the contained gas and pressure, installed in accordance with accepted methods. Use only listed/approved manifold assemblies for connecting cylinders together.
12. Do not accept delivery from the gas supplier unless cylinders are clearly marked with the name of the gas contained.
13. Always carefully check to ensure use of designated gas for specific processes.
14. Make sure special connectors are in place to prevent connecting wrong cylinders.
15. Use "Snoop", soapy water, or leak detection equipment to test for leaks in the gas delivery system.
16. Maintain cylinders and accessories in good condition.
17. Do not paint or make repairs to cylinders, valves, and safety relief devices.
18. Transport, store, and use cylinders in an upright position, unless listed/approved for use in another position. Securely fasten cylinders with non combustible straps or chains to prevent them from falling or being knocked over.
19. Leaking cylinders, regulators, tubing, or piping can quickly contaminate a large area. If the leak cannot be stopped by closing the valve:
    a. Relocate the cylinder to the out-of-doors, away from sources of ignition. Immediately notify your supervisor.
    b. Place a warning sign near cylinders advising others to stay away.
    c. Immediately contact the supplier for disposal of the cylinder once the emergency is stabilized.
    d. If a cylinder or valve is noticeably corroded, leaking or damaged, the vendor shall be contacted, and their instructions followed. Any other damage that might impair the integrity of the cylinder shall be called to the attention of the vendor before the cylinder is returned.
20. Transferring compressed gases from one commercial cylinder to another is not permitted.
21. Rooms or cabinets containing compressed gases must be conspicuously labeled COMPRESSED GAS.
22. Piping systems require additional labeling and markings. Contact your BU Fire Protection for your specific requirements.
23. Mixtures shall be classified in accordance with the hazards of the mixture as a whole.

12.1 Cylinder Use and Handling

1. Compressed gas cylinders must be handled by experienced and properly trained personnel.
2. When handling cylinders:
    a. Do not modify, tamper with, paint, deface, obstruct, remove, or repair any part of the cylinder, pressure relief device, or the container valve.
    b. Maintain an inventory of all gas used and stored in their area.
    c. Ensure the proper disposal of the cylinder when it is empty or no longer needed.
    d. Do not drop, strike or allow cylinders to fall or be subjected to other damage.
    e. Handle cylinders in a manner that prevents them from being struck together violently.
    f. Keep cylinders 50 feet away from welding and cutting operations or provide fire-resistant shields.
    g. Do not place cylinders where they might become part of an electric circuit.
    h. Keep cylinders away from equipment, piping systems, etc., that may be used for grounding electric circuits (such as for arc welding machines).
    i. Do not tap an electrode against a cylinder to strike an arc.
    j. Never use cylinders as rollers or supports, whether full or empty.
    k. Do not use cylinders without first attaching a regulator to the cylinder valve unless connected to a manifold.
    l. Mark empty cylinders EMPTY or MT and store apart from full cylinders while waiting to be removed.
    m. Before using the gas, read label information and the Safety Data Sheet (SDS).

12.2 Regulator Use

1. Never use a cylinder without a regulator.
2. Always use the correct pressure regulator and proper regulator for the gas.
3. Before attaching cylinders to a connection, be sure that the threads on the cylinder and the connection mate (regulator or other fitting) are the type intended for this specific gas.
4. Before connecting a regulator to a cylinder valve, the valve shall:
    a. Be opened slightly and closed immediately (blow out dust/crud).
    b. Be opened while standing to one side of the outlet, never in front of it.
5. Attach the regulator securely with the secondary valve closed and with the regulator flow backed off before opening the cylinder valve wide.
6. Always use a proper cylinder wrench to tighten the regulator nut and tube connections.
7. Do not use Teflon tape on cylinder connections or tube-fitting connections.
8. When removing a regulator from a cylinder, first close the cylinder valve and bleed off all pressure from the regulator.
9. Do not use a regulators without a pressure relief device.
10. After attaching the regulator and before the cylinder is opened, check the adjusting screw of the regulator to see that it is released. Never permit the gas to enter the regulator suddenly.

12.3 Cylinder Valves and Protection Caps

1. Open all cylinder valves slowly.
2. Point the valve opening away from yourself and others.
3. Never use a wrench or hammer to open or close a hand-wheel type cylinder valve.
4. Protect cylinder valves with a protection cap when not in use. The cap should be hand tight. Never force a cap or regulator.
5. Never lift a cylinder by the cap.
6. Do not use bars under valves or valve-protection caps to pry cylinders loose when frozen to the ground or otherwise fixed; the use of warm (not boiling) water is recommended.
7. Operate cylinder valves and regulators in accordance with the manufacturer's instructions.
8. When using the gas, open valves slowly to the wide-open position.
9. Keep valve handles in place for quick emergency shutdown.

10. Acetylene cylinder valves shall be opened only 1/2-turns.
11. Do not stand in front of the regulator gauge glass when opening the valve.
12. Never crack open a fuel-gas cylinder valve near other welding work or near sparks, flame, or other possible sources of ignition.
13. When valves are noticeably corroded, immediately contact the vendor and follow their instructions. Any other damage that might degrade the integrity of the cylinder shall be called to the attention of the vendor before the cylinder is returned.
14. Cylinder valves shall be closed before moving cylinders, when work is finished and on all empty cylinders or cylinders that are not in use.
15. Cylinders not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations, a minimum of one key or handle is required for each manifold.

12.4 Transporting Cylinders

1. Use a cradle, boat, or suitable platform when transporting cylinders by a crane or derrick.
2. Use a cradle for hoisting. Slings or electric magnets shall not be used.
3. Avoid dropping and striking cylinders together.
4. Use a suitable hand truck (mounting 1 or 2 cylinders) with the cylinder(s) firmly secured. Unless cylinders are secured on a special hand truck, regulators shall be removed, and valve protection caps shall be put in place.
5. Avoid dragging, sliding, or rolling cylinders.
6. Cylinders must be secured with non-combustible straps or chains while being transported and when in motor vehicles.
7. Use the Freight Elevator when possible. If there is no Freight Elevator, do not use an elevator with people in it and do not allow people to enter the elevator when transporting cylinders. When transporting compressed gases in elevators, send the cylinder up by itself and then follow in another elevator or stairs.

12.5 Cylinder Marking

1. Ensure compressed are labeled in accordance with the appropriate DOT specifications.
2. Each cylinder must be marked by label or tag with the name of its contents.
3. Do not accept cylinders without the appropriate labels.
4. Check the identity of the gas before use.
5. Segregate cylinders that cannot be legibly identified prior to returning.
6. Return cylinders to the supplier immediately when:
    a. The cylinder content is not identified
    b. If hydrostatic test date is past due.
    c. If the cylinder is in any way damaged.

12.6 Cylinder Storage

1. Protect cylinders against mechanical damage. Provide racks or other means to hold them securely.
2. Always secure compressed gas cylinders upright (with valve end up) to a wall, cylinder hand truck, cylinder rack or post, unless the cylinder is specifically designed to be stored otherwise.
3. Secure cylinders with non-flammable straps, chains or other means that will prevent them from falling or being knocked over.
4. Cylinders shall be secured around the body of the cylinder (approximately 2/3 of the height but no less than below center height of the cylinder) and never at the neck of the valve.
5. Keep valve caps in place except when cylinders are in use.
6. Post cylinder storage areas with the names and hazard class of the gases to be stored.
7. Do not store or stage cylinders in corridors, elevators, lobbies, stair towers, exit ways, unventilated enclosures or lockers, or other areas adjacent to or obstructing an exit way.

8. Do not store cylinders that are not “in use” in the “in use” area. (“in use” means connected through a regulator or, connected to a manifold used to deliver gas, or a single cylinder secured alongside the cylinder as the reserve cylinder).
9. When gases of different types are stored at the same location, group cylinders by type of gas and arrange the cylinders with consideration of the type of gas contained (e.g., flammable gases shall not be stored next to oxidizing gases).
10. When gases of different types are stored at the same location, group cylinders (empty or full) by the type of gas (e.g., flammable, oxidizer, or corrosive). EXCEPTION: Inert gases can be stored with any other type of gas.
11. Store oxygen cylinders and fuel gas cylinders in bays separated 20-ft or by a 30-minute firewall at least 5-ft high. This does not apply to single bottles of each gas on carts.
12. Store full cylinders separately from empty cylinders.
13. Use cylinders by the "first in, first out" guideline.
14. Mark empty cylinders as “empty” (or MT) by:
    a. Labeling the cylinder (chalk or by some other means).
    b. Labeling the rack or storage area that the cylinder is within.
15. Storage rooms shall be dry, cool, and well ventilated.
16. Do not store cylinders at temperatures >125°F or near radiators or other sources of heat. Cylinders must be stored:
    a. ≥20-ft from incompatible materials and
    b. ≥10 feet from combustible material, including vegetation.
17. Do not store cylinders under refrigeration without the approval of the supplier.
18. Cylinders stored outside must be
    a. Protected against extremes of weather. Provide a noncombustible canopy to shield cylinders from the weather and direct rays of the sun.
    b. Protected against combustible waste and vegetation. Dry grass, weeds, vegetation’s and other combustibles must be kept ≥10-ft from the cylinders.
19. Keep cylinders off the ground on a raised concrete pad or noncombustible rack.
20. Protect against unauthorized access by surrounding the area with substantial wire fencing.
21. Cylinders must be protected from any object that will produce a cut or other abrasion in the surface of the metal.
22. Do not store near elevators or gangways, or in locations where heavy moving objects may strike or fall on them.
23. Each cylinder in use (individually or via a manifold) must be individually secured. Nesting of “in use” cylinders is not permitted. Nesting is permitted for cylinders that are not in use or cylinders that are empty.
24. Do not store gas cylinders with pressure on the regulator.
25. Secure storage, use, and handling areas against unauthorized entry.
26. Locate outdoor cylinder storage facilities:
    a. >6000-ft³ at least 25-ft from any unprotected wall opening with critical operations.
    b. >15,000-ft³ of a heavier-than-air gas, storage shall be at least 50-ft from any unprotected wall opening.
27. Detached buildings for flammable-gas cylinders shall be >50-ft from critical buildings and equipment.
28. Use light noncombustible construction on steel framing except when <50-ft from buildings with critical operations that are combustible or have unprotected openings. These walls shall be of 2-hr rated, fire-resistive construction.
29. Cut-off rooms or enclosures at exterior walls of buildings with critical operations may be used to store lighter-than-air flammable gases in cylinders provided 2-hr fire resistive construction is in place and the entrance is from outside the main building, with no interior doorways or other openings to critical areas.

30. Explosion venting shall be provided in detached buildings, cut-off rooms, and enclosures housing flammable-gas cylinders, in the ratio of at least 1-ft² of vent area per 15-ft³ of room volume.
31. Corrugated metal, corrugated asbestos, and lightweight insulated metal panels, arranged to release when subjected to a 20-psf internal pressure, or listed/approved explosion-venting windows are acceptable.
32. Explosion venting may be omitted from detached buildings having less than 400-ft² of floor area.
33. Store flammable gases (lighter-than-air) according to the following standards:
    a. In main areas of buildings, limit the amount of gas to 3000-ft³ of cylinder capacity.
    b. In cut-off rooms with automatic sprinkler protection, limit the amount of gas to 15,000-ft3 of cylinder capacity.
    c. In cut-off rooms without automatic sprinkler protection limit the amount of gas to 6000-ft3 of cylinder capacity.
34. Safeguard heavier-than-air gases, as follows:
    a. Permit only one cylinder at a time to be used indoors in a main area and move the cylinder outdoors when not in use. If more than one cylinder is required for a process, locate all out-of-doors and pipe the gas to the point of use.
    b. Natural ventilation will normally be adequate in large areas having high roofs or ceilings. Positive ventilation shall be provided in pits, basements, or other below-grade spaces to which the gas may flow.
    c. Do not locate cylinders in basements or other low spaces or where escaping gas can penetrate to such spaces.
    d. If cylinders are manifolded, provide hydraulic flame arresters on the discharge side of fuel-gas-pressure regulators where an oxygen or air mixture may form in the supply line and there is a possible ignition source, or where oxygen or air may back up in the supply line.
35. Provide natural ventilation through permanent louvered openings near floor and ceiling.
36. Not more than 100 ft³ of flammable gas shall be used and stored (combined quantity) in a fire control area. Other limitations:
    a. In rooms (including laboratory-type areas) 500-ft² or less, not more than 6-ft³, of the flammable gas shall be used and stored.
    b. Larger areas (>500-ft²), not more than 0.012-ft³/ft² per work area be used and stored.
37. Store flammable gases in well-ventilated areas away from flammable liquids, combustible materials, oxidizers, open flames, sparks, and other sources of heat or ignition. Storage options consist of either a distance of 20-ft, or placement of a noncombustible barrier ≥18-in above the tallest container, but not <5-ft in height, and laterally ≥18-in beyond the sides of the containers; having a fire resistive rating of at least 30-minutes.
38. Ensure Class B portable fire extinguishers are available for fire emergencies where flammable gas is stored or used.
39. Use spark-proof tools when working with flammable gas cylinders.
40. In the event of an emergency involving a flammable gas, such as a gas leak, fire, or explosion, immediately evacuate the area. Do not attempt to extinguish burning gas if the flow of product cannot be shut off immediately and without risk.
41. Buildings of noncombustible construction containing lighter-than-air flammable-gas cylinders with total capacity <6000-ft3 do not require sprinkler protection. However, if there is combustible occupancy, heavier-than-air flammable-gas cylinders or if the cylinders are an exposure hazard to personnel, other buildings, or important equipment, automatic sprinklers shall be installed over the cylinders (Extra Hazard Group 2 density) and for 20-ft beyond in all directions.
42. Install electrical equipment in cylinder rooms as specified in the NFPA 70 National Electrical Code for Class I, Division 2 locations.
43. Heat cylinder buildings and rooms by steam or hot water.
44. Ground and bond all lines and equipment associated with flammable gas systems.

12.7 Protection from Vehicular Damage

1. Where required, guard posts or other approved means shall be provided to protect against physical damage. Guard post shall be:
    a. Constructed of steel not less than 4-in. in diameter and concrete filled. 6” or larger may be considered, due to difficultly with placing concrete within a 4-in diameter pipe.
    b. Spaced not more than 4-ft between posts on center.
    c. Set not less than 3-ft deep in a concrete footing of not less than a 15-in. diameter.
    d. Set with the top of the posts not less than 3-ft above ground.
    e. Located not less than 5-ft from the tank.
    f. Painted in a high-visibility color with contrasting stripes.
2. Guard posts, bollards or other approved means shall be provided to protect the following areas where subject to vehicular damage:
    a. Storage tanks and connected piping, valves, and fittings.
    b. Storage areas containing tanks or portable containers except where the exposing vehicles are powered industrial trucks used for transporting the hazardous materials.

12.8 Smoking & Ignition Source Controls

1. Do not smoke in the following locations:
    a. Within 50-ft of outdoor storage areas, dispensing areas, or open use areas.
    b. Smoke free zones as described in the TVA Employee Handbook shall apply to eliminate ignition sources. Signage shall designate all smoking areas, which shall be more than 50-ft. from areas containing combustible materials.
2. Do not use open flames, high-temperature devices or any fuel powered equipment in a manner that creates a hazardous condition.
3. Energy-consuming equipment with the potential to serve as a source of ignition shall be listed or approved for use with the hazardous materials stored or used.

12.9 Safeguards for Acetylene

1. Always store and use cylinders in an upright position.
2. Do not place anything on top of an acetylene cylinder which may damage the safety device or interfere with the quick closing of the valve.
3. Do not handle acetylene cylinders roughly, subject them to hydrostatic test, or take any other action that can create large voids in the mineral filler.
4. Provide separate storage locations for acetylene and oxygen (or other oxidizers) cylinders.
5. Do not withdraw acetylene from a cylinder or manifold at a rate in excess of one-seventh (1/7) of the total cylinder capacity per hour.
6. On indoor manifolds, limit the amount of gas connected to 3000-ft^3. Limit the amount of acetylene cylinder storage indoors, not in use or connected to manifolds, to 2000-ft^3.
7. Use a pressure regulator at the discharge of an individual cylinder or manifold to reduce the gas pressure to $\leq$15-psi.
8. Keep acetylene cylinder valves closed when gas is not being used and open the valves only 1and 1/2 turns when in use.

12.10 Acetylene Piping Systems from Cylinders

1. Acetylene piping pressures shall not exceed 15-psig except where necessary for cylinder charging or special processes.
2. Only open acetylene cylinder valves 1 and 1/2-turns.
3. Locate permanent cutting and welding operations in noncombustible buildings at stations served by properly protected, designed, and installed distribution systems.
4. Use wrought iron or steel pipe and steel or malleable-iron fittings. Welded joints are preferable because of the reduced probability of leakage. Alloys containing >67% copper shall not be used

for piping, valves, or fittings (with the exception of the torch tip, which is pure copper). Use lubricated plug cocks or globe valves with fiber or metal seats.
5. Locate inside piping overhead and away from exposure to excessive heat or vibration.
6. Use crosses for any necessary turns in the mains.
7. Provide rupture disks at all dead ends.
8. Provide hydraulic flash arresters in connections between mains and process equipment.
9. If moisture is present, pitch overhead piping to drain to hydraulic flash arresters, or drip pots. Pitch underground piping in the direction of acetylene flow and to drain into drip pots.
10. Provide accessible, conspicuously labeled, control valves so that any selection of the distribution system can be shut off readily in an emergency.
11. Where meters are needed, use steel-case or orifice-type flow meters. Install a hydraulic flash arrester to protect the meters against damage from flashback.
12. Before placing acetylene piping in service, test pipe to air or inert-gas pressure of at least 150% of maximum working pressure and check for loss in pressure.
13. On cutting and welding systems provide the following protection to prevent reverse flow of oxygen or the passage of a flashback:
    a. Low-pressure Systems. Install a(n) listed/approved low-pressure hydraulic flash arrester at each station outlet.
    b. Medium-pressure Systems. Provide either a medium-pressure station hydraulic arrester or an acetylene-pressure regulator and check valve at each station outlet. If the regulator and check valve are used, the distribution system shall be sectionalized, and each section protected by a branch-line hydraulic arrester.
14. Ensure the relief-vent pipes of all hydraulic arresters lead to a safe location outdoors where they will not be exposed to ignition sources and where no burst of flames will be directed onto a building, combustibles, or personnel.
15. Branch-line arresters shall have individual relief-vent pipes, but vent pipes for station hydraulic arresters may be manifolded.
16. Check the liquid of all hydraulic arresters weekly and add water as necessary. Protect hydraulic arresters from freezing.

12.11 Safeguards for Chemically Active Gases

Certain combinations of gases will react chemically to produce heat or cause a fire or an explosion.

1. Do not store cylinders of chemically active gases in the same area.
2. Do not store or release combinations of gases that will react to produce flame in the same area.

12.12 Safeguards for Corrosive, Toxic and Highly Toxic Gases

These gases typically present little fire hazard, but if released in a fire may interfere seriously with firefighting.

1. Check cylinders containing corrosive chemicals periodically to ensure that the valve has not corroded.
2. Permit only one cylinder at a time in main indoor areas.
3. If two or more cylinders are required, provide a small-detached building of noncombustible construction, or a room or enclosure cut off from main areas by a blank gas-tight wall. Provide a remotely controlled valve or other accessible means for shutting off the gas in an emergency.
4. Keep the cylinder location completely free of combustibles, including flammable gases.
5. Main indoor areas shall have positive exhaust ventilation.
6. Not more than 810 ft³ of corrosive gas can be used and stored (combined quantity) in a fire control area.
7. Keep exposure to gas as low as possible. Use a fume hood or other vented enclosure when possible. Avoid contact with skin and eyes.

8. Wear appropriate PPE for the gas being used.
9. An operational emergency shower and eyewash must be in the area where corrosive materials, including corrosive gases, are used.
10. Safety plugs in the valves of chlorine cylinders fuse at 157°F which results in pressure relief and escape of chlorine gas. Care must be exercised to see that they are not exposed to steam, hot water, etc. which could produce this temperature.
11. Not more than:
    a. 1,62 ft³ of toxic gas can be in storage and 810 ft³ in use in a fire control area.
    b. 40 ft³ of highly toxic gas can be in storage and 20 ft³ in use in a fire control area.
    c. In rooms ≤500 ft², not more than 0.3 ft³ of gas may be stored.
    d. In rooms >500-ft², not more than 0.0006-ft³ / ft² of area can be used and stored.
12. Wear safety goggles when handling toxic compressed gases.
13. A gas detection system with visible and audible alarms to detect the presence of leaks, etc. must be installed for all toxic and highly toxic gases when the physiological warning properties for the gas are at a level below the accepted Permissible Exposure Limit (PEL) or Ceiling Limit for the gas.

12.13 Safeguards for Cryogenic Gases

1. Follow the appropriate precautions listed in the Cryogenic Material Section of this manual.
2. Wear appropriate PPE for the situation.
3. Wear appropriate insulated gloves to protect from the extreme cold when handling cryogenic containers. Gloves need to be loose fitting so that they can be readily removed in the event liquid is splashed into them.
4. Never allow an unprotected part of the body to touch uninsulated pipes or containers of cryogenic material.
5. Always handle cryogenic cylinders in accordance with manufacturer and supplier instructions.

12.14 Safeguards for Oxygen and Oxidizers

1. Separate oxygen cylinders from acetylene cylinders or manifolds containing flammable gases, and from other combustible materials.
2. Locate oxygen cylinders and manifolds outdoors, in detached buildings, or in a cut-off room of noncombustible construction.
3. Do not use oil or grease for lubricating valves, gauge connections, or other parts of the system.
4. Not more than 1500 ft³ of oxidizing gas shall be used and stored (combined quantity) in a fire control area.
5. Other limitations for storage include:
    a. In rooms (including lab areas) ≤500 ft², not more than 6 ft³
    b. Larger areas (>500 ft²), not more than 0.012 ft³ / ft² per work area can be used and stored.
6. All equipment used for oxidizing gases must be cleaned with oxygen-compatible materials free from oils, greases, and other contaminants (hydrocarbons and neoprene are not oxygen-compatible. The equipment will state that it is oxygen compatible). Do not handle cylinders with oily hands or gloves.
7. Oxidizers shall be stored separately from flammable gas containers or combustible materials. Storage options consist of either:
    a. A distance of 20 ft, or
    b. Placement of a noncombustible barrier ≥18-in above the tallest container, but not <5-ft in height, and laterally ≥18-in beyond the sides of the containers; having a fire resistive rating of at least 30-minutes.

12.15 Safeguards for Liquid-Oxygen Cylinders

1. Locate cylinders and manifolds out of doors in detached buildings or in cut-off rooms of noncombustible construction.
2. Where floor or pad drainage is needed, use wall scuppers or exterior doorways, and pitch the pad to the outer edge. Do not use floor drains, trenches, or other drainage arrangement involving enclosed, below-grade, or floor-level drainage-system elements. Ramp, curb, or pitch floors at interior doorways of cutoff rooms to prevent passage of liquids into or out of the room.
3. Limit quantities in cut-off rooms to eight (8) cylinders or less.
4. Enclosed structures shall be well ventilated. Positive mechanical ventilation of at least 0.25 cfm/ft² of floor area or natural ventilation of 1 ft² each of free inlet and outlet openings per 500 ft² of floor area is recommended.
5. Install/handle liquid-oxygen cylinders in accordance with the manufacturer's recommendations.
6. Use equipment such as manifolds and cylinder leads specifically approved for service with these cylinders. When standard gas cylinders are used for standby, manifold equipment shall be a high-pressure type arranged and connected to the distribution system in accordance with the manufacturer's instructions.
7. Handle cylinders in an upright position only.

12.16 Safeguards for Bulk Oxygen Storage

1. Locate bulk oxygen storage, including fixed or portable high-pressure bulk units and/or liquid-oxygen equipment, out of doors or in a detached noncombustible structure used solely for this purpose and separated as follows:
    a. 75 ft from:
        i. Aboveground ignitable-liquid tanks of ≥1,000-gal capacity.
        ii. Aboveground tanks of liquefied flammable gases of >1,000-gal aggregate water capacity.
        iii. Low-pressure flammable-gas storage of ≥5,000 ft³ capacity.
        iv. Unsprinklered combustible buildings.
        v. Combustible yard storage.
        vi. Wood exterior walls.
    b. 25 ft from:
        i. Aboveground ignitable-liquid tanks of <1,000-gal capacity.
        ii. Aboveground tanks of liquefied flammable gases of ≤1,000-gal aggregate water capacity.
        iii. Filling or vent connections to underground ignitable liquid tanks.
        iv. Low-pressure flammable-gas storage <5,000 ft³ capacity.
        v. Sprinklered buildings or buildings with both construction and occupancy noncombustible.
        vi. High-pressure bulk flammable-gas storage.
        vii. Ignitable liquid unloading stations.
    c. 5-ft from:
        i. Noncombustible construction having blank walls 10-ft above and 10-ft on each side of the equipment.
2. Regulators and other control equipment may be located indoors in a noncombustible building detached or cut off from main buildings or combustible storage. Cutoffs shall have at least a 1-hour fire resistance rating.
3. Locate outdoor oxygen-storage equipment on a base of crushed stone or concrete. Keep the ground area within 15 ft of the equipment free of high weeds and grass by frequent mowing or the application of an herbicide.
4. Keep liquid oxygen containers, piping, and equipment clean and free of grease, oil, and organic materials.

13 Confined Space

1. Confined Space Entry shall be executed in accordance with the requirements found in TVA-TSP-18.801, Confined Space Entry.
2. A confined space is defined as a space that:
    a. Is large enough and so configured that a person can bodily enter and perform assigned work; AND
    b. Has limited or restricted means for entry or exit (for example tanks, vessels, vaults, heaters and pits are spaces that may have limited entry); AND
    c. Is not designed for continuous employee occupancy.
3. A Permit-Required Confined Space is a confined space with one or more of the following characteristics:
    a. Contains or has the potential to contain a hazardous atmosphere, OR
    b. Contains a material with the potential for engulfing an entrant, OR
    c. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section, OR
    d. Contains any other recognized serious safety or health hazard.
4. The entry supervisor is the ultimate authority over the space.
5. Be aware of the possibility of a work area being a confined space. Some are not obvious such as a large valve with a bonnet off or an open pipe.
6. All confined spaces require a permit until proven otherwise. Never enter a confined space that has not been evaluated. At a minimum, confined spaces that have been properly evaluated shall have Form 20639, Hazard Evaluation Form posted at non permit spaces or attached to the permit for permit required spaces.
7. For permit entry spaces, never enter a space that does not have a posted permit. Read the posted permit to ensure it is current and you understand the requirements and the hazards in the space prior to entering including the signs, symptoms and consequences of exposure.
8. Ensure you are authorized to enter a permit space and that an attendant is on duty before entry.
9. Do not enter the space to rescue personnel from a confined space unless you are qualified and serving as part of the rescue team.
10. Reference the site confined space inventory list for more information about the space.

14 Contractor Safety

1. Contractors are expected to have safety plans applicable to the work they are performing. TVA-SPP-18.004 Contractor Safety Management, outlines the requirements for managing contractors working at TVA.
2. Contractors are expected to provide trained personnel for the tasks being performed. In certain cases, contractors are required to complete TVA training. Reference TVA-SPP-18.004 for a list of TVA required training.

15 Conveyors

1. Use conveyor equipment only for the specified materials and within the rated capacity and the rated speed of the equipment.
2. When performing maintenance on a conveyor, ensure:
    a. Qualified personnel are performing maintenance and service.
    b. No maintenance or service is performed when a conveyor is in operation except as provided in this section.
    c. When a conveyor is stopped for maintenance or service, tag out the starting device, prime movers, or powered accessories in accordance with TVA-TSP-18.613. Alert personnel to the hazard of stored energy, which may exist after the power source is out.
    d. The emergency stop cable is not used in lieu of clearance procedure.
3. Replace all safety devices and guards before starting equipment for normal operation.
4. When adjustment, lubrication, or maintenance must be done while the equipment is in operation, ensure only qualified personnel who are aware of the hazard of the conveyor in motion perform these tasks.
5. Grease fittings shall be extended through guards.
6. When belts, cables, chains, and similar means support counterweights, they shall be confined in an enclosure to prevent the presence of personnel beneath the counterweight.
7. All exposed moving machinery parts that present a hazard to personnel shall be mechanically or electrically guarded or guarded by location or position.
8. Spill guards, pan guards, or equivalent shall be provided if material and/or lubricants may fall off the conveyor and endanger personnel.
9. Control stations shall be clearly marked or labeled to indicate the function controlled.
10. Do not start any conveyor that would cause injury when started until personnel in the area are alerted by a signal or by a designated person that the conveyor is about to start.
11. A conveyor that would cause injury when started that is automatically controlled or must be controlled from a remote location must be equipped with audible device or devices that can be clearly heard at all hazardous points along the conveyor where personnel may be present.
12. The audible warning shall be actuated by the controller device starting the conveyor and shall continue for a required period before the conveyor starts.
13. A flashing light or similar visual warning may be used in conjunction with, or in place of, the audible device if a visual warning is more effective. The audible/visual alarm requirement is applicable to new systems and those on which major modifications have been performed subsequent to the year 1995. If the system was installed before January 31, 1995, warning signs may be provided in place of the audible warning device until the conveyor, or its control system is rebuilt or rewired.
14. Remotely and automatically controlled conveyors, and conveyors where operator stations are not manned or are beyond voice or visual contact from drive areas, loading areas, transfer points, and other potentially hazardous locations on the conveyor path not guarded by location, position, or guards, shall be furnished with emergency stop buttons, pull cords, limit switches, or similar emergency stop devices must meet the following:
    a. All such emergency devices shall be easily identifiable in the immediate vicinity of such locations, and.
    b. The emergency stop device shall act directly on the control of the conveyor concerned and shall not depend on the stopping of any other equipment. The emergency stop devices shall be installed so they cannot be overridden from other locations.
15. Only operate a conveyor if you are properly trained.
16. Where safety is dependent upon stopping devices or starting devices or both, keep these devices free of obstructions to permit ready access.
17. Never ride on a conveyor.
18. Do not cross over a conveyor belt, except at walkways, unless the conveyor's energy source has been deenergized and properly tagged out.

19. When working on or near a conveyor, understand the location and operation of stopping devices.
20. Conduct routine inspections and corrective maintenance measures to ensure that all guards and safety features are retained and function properly.
21. Understand the potential hazard of entanglement in conveyors caused by items such as long hair, loose clothing, and jewelry.
22. Ensure all openings to hoppers and chutes are guarded to prevent personnel from accidentally falling or stepping into them or allowing any part of their body to contact conveyors below them.
23. Where coal-handling operations may produce a combustible atmosphere from fuel sources or from flammable gases or dust, sources of ignition shall be eliminated or safely controlled to prevent ignition of the combustible atmosphere. Locations that are hazardous because of the presence of combustible dust are classified as Class II hazardous locations.

15.1 Belt Conveyors

1. Ensure nip and shear points are guarded.
2. Take-up mechanisms may be guarded as an entity by placing standard railings or fencing around the area with suitable warning signs, as an alternative to guarding individual nip and shear points.
3. Use only trained personnel to track a conveyor belt, which must be done while the conveyor is operating.
4. Do not apply a belt dressing or other foreign material to a rotating drive pulley or conveyor belt.

15.2 Bucket Conveyors

1. Guards shall be provided at points where personnel could come in contact with cables, chains, belts, runways, or exposed bucket conveyors.
2. Inspection doors and maintenance doors shall include signs warning of possible danger if opened or removed while the conveyor is in operation.

15.3 Trippers

1. Trippers or shuttles may discharge into silo or bunker openings, with or without seals. In either case, openings shall be provided with grating to suit the material being handled, and the width of the openings shall not be large enough to permit personnel to fall through.
2. Where material size requires openings that would permit personnel to fall through, the openings shall be protected with a means adequate to prevent personnel from falling through.

16 Cranes

1. Safe crane operations require thorough work planning and adherence to all applicable rules and regulations. Crane Operations shall be executed in accordance with TVA-TSP-18.802, Requirements for the Safe Operations of Cranes
2. Ensure that the equipment you are about to operate has been properly inspected and is certified for operation.
3. Perform an operational inspection as required for that piece of equipment.
4. Never operate a crane that is unsafe.
5. Never permit an unauthorized person to operate the crane or give the signals.
6. Ensure that the operator and signal persons are in direct and clear view of each other. Where this is not possible, signals shall be given via voice commands by means of electronic devices using dedicated channels.
7. Never carry a load over workers.
8. Always use warning signals before and during moves.
9. Never allow anyone to ride on the load or hooks.
10. If a load appears to be rigged improperly, lower it and have it adjusted.

11. When working in areas with crane operations underway:
    a. Stay alert and pay attention to loads overhead.
    b. Never stand or walk under a load, whether it is moving or stationary.
    c. Always warn others of moving and approaching overhead loads.
    d. Never attempt to distract signal persons or operators during operation.
    e. Always obey warning signs, especially those that are posted in critical areas.

17 Diving

1. Use of divers at any site requires assignment of a Diving Contract Coordinator. The TVA Power Service Shop has a Diving Contractor Coordinator to assist sites with diving contractors and safe diving operations.
2. In lieu of obtaining the services of the Power Service Shop Diving Coordinator, sites may choose to appoint personnel as the Diving Contractor Coordinator(s) for oversight of all diving operations and to perform the roles and responsibilities listed in this section.
3. The Diving Contractor Coordinator will be the person in charge of customer interface during the performance of diving operations on a project.
4. Diving Contractor Coordinators have the authority to stop any dive operation if, in their judgment, personnel safety is at risk or eminent hazards exist.
5. The Diving Contractor Coordinators shall have experience and training in commercial diving operations and demonstrate knowledge of diving principles and OSHA, ADCI and TVA requirements.
6. The Diving Contractor Coordinator serves as a liaison between TVA and the diving contractor and:
    a. Reviews the scope of work and submits clearance requests.
    b. Serves as the point of contact for the diving contractor on all issues related to clearances, safe work practices, and TVA policies and procedures.
    c. Reviews and accepts safe diving manuals and plans, all pre-dive documentation, emergency response plans and job safety analysis.
    d. Provides oversight during diving operations by making regular visits to the dive sight and remaining at the dive location as necessary to ensure safe execution of underwater diving.
    e. Stops contractor's dive if any safety concern or unsafe condition so warrants such as weather changes, flow changes, equipment conditions, etc.
    f. Ensures all dive activities are conducted in accordance with 29 CFR OSHA 1910, Subpart T - Commercial Diving Operations, the Association of Diving Contractors International (ADCI) Consensus Standards for Commercial Diving Operations; and this section.
    g. Ensures the diving contractor conducts adequate pre-dive planning and assessment, and inspections.
    h. Ensures hazards have been identified and mitigation is complete before diving activities occur or when there is a change in scope.
    i. Ensures communication with site operations as necessary to inform Operations of the status of the dive, when divers are in and out of the water, etc.
    j. Ensures all diving contractor records are in order and include diver names, location, date and time, working depth, total bottom time, RNT time, surface interval times and all conditions pertinent to the dive.
    k. Ensures dive contractors have a list of the following at the dive location:
        i. Access to an operational decompression chamber (if not at the dive location).
        ii. Accessible hospitals.
        iii. Available physicians.
        iv. Available means of transportation.
        v. The nearest U.S. Coast Guard Rescue Coordination Center

7. Each site is responsible for receiving and reviewing Clearance requests for Dive Operations.
8. Site Operations personnel shall work closely with the Dive Contractor Coordinator to ensure the scope of work is thoroughly understood and an adequate clearance is in place in accordance with TVA-TSP-18.613,Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout and any specific business unit specific clearance procedure that has been developed.
9. Site Operations may permit or deny diving operations based on plant needs or concern for safety.
10. The Dive Contractor is responsible for safe diving operations and adherence to all applicable regulations, policies and procedures.
11. The Dive contractor shall ensure:
    a. All dive activities, processes and recordkeeping meet or exceed the requirements set forth in CFR 1910, Subpart T.
    b. Each dive team member has the appropriate ADCI certification card or equivalent qualification for the position they are responsible for and that each dive team member is fully qualified to perform all assigned tasks.
    c. All dive team members have proper medical certifications and physicals which note fitness to dive and are valid for the tasks they are assigned to perform.
    d. Dive Supervisors or foremen meet or exceed Dive Supervisor qualifications references in the ADCI consensus standards.
    e. All dive team members have an annual diving physical, performed by a physician knowledgeable in hyperbaric exposure.
    f. Divers have a minimum of 3 years of power plant related diving experience and have performed diving work on a regular and routine basis during the past 2 years.
    g. Each dive team member shall have experience or training in the following:
        i. Basics of commercial diving acquired by graduating from an accredited commercial dive school, or the military equivalent.
        ii. Exception: Individuals having graduated from Commercial Dive Schools prior to 1996 are considered grandfathered for their basics in commercial diving. Grandfathering shall also apply to individuals having graduated from Commercial Dive training facilities, which discontinued their commercial dive training program prior to 1996.
        iii. Techniques of the assigned diving mode.
        iv. Diving operations and emergency procedures.
        v. Cardiopulmonary resuscitation (CPR) and first aid (American Red Cross (ARC) standard course or equivalent) and shall follow ARC retraining schedules, i.e., 2-year CPR and 2-year first aid.
12. The Dive Contractor shall perform pre-dive planning and inspections.
13. Dive Supervisors or dive foremen shall maintain full responsibility for safe diving operations and the safety of dive team members.
14. Prior to the commencement of diving activities, Diving Contractors shall submit the following to the TVA Diving Contractor Coordinator for review. Diving shall not commence until these documents have been reviewed and accepted as adequate by TVA.
    a. Safe Diving Practices Manual. This manual must meet or exceed the requirements set forth in CFR 1910, Subpart T and must be a current revision (updated in the last three years).
    b. Verification of qualifications of dive team members including experience and medical qualifications to dive.
15. To the extent possible, the dive area shall be free of unnecessary personnel. Only those listed in the dive plan and personnel necessary to fulfill the requirements of this section shall be allowed in the dive area.
16. Dive Teams shall consist of a minimum of four (4) qualified individuals: one (1) dive foreman, one (1) diver and two (2) dive tenders, all possessing the experience and training to perform assigned tasks safely.

17. Dive team members who are exposed to or control the exposure of others to hyperbaric conditions shall be trained in diving related physics and physiology.
18. A dive team member shall not be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.
19. Dive team members shall not be permitted to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition, which is known and is likely, to affect adversely the safety or health of a dive team.

18 Dredging

1. When planning the work, use various navigation chart sources for the area where dredging operations will occur to help identify underwater hazards such as piping.
2. Engage site engineering and Dam Safety in dredging operations as appropriate.
3. Use various navigation chart sources for the area where dredging will occur for planning the work.
4. Prior to beginning dredging operations, ensure underwater obstacles are identified. The United States Army Corps of Engineers (USACE) and TVA River Operations are good resources to contact for validation.
5. Hazard identification and mitigation may be documented using the Job Safety Analysis process in TVA-TSP-18.006.

19 Drilling and Chipping in Concrete

1. This section only applies to work being performed where the drilling or chipping will exceed 2 inches in depth.
2. Drilling, Chipping or Boring on Dam structures require coordination with TVA Dam Safety.
3. Before drilling and chipping on concrete where the drilling or chipping will exceed 2 inches in depth:
    a. Determine the exact work location and scope of work.
    b. Review any reference drawings. Consult engineering if drawings are not clear or assistance is needed.
    c. Determine if any embedded items are identified.
    d. Determine if any special precautions are necessary such as rebar protection devices, depth restrictions, pachometers, drill stop devices, etc.
    e. Obtain necessary reviews to ensure all impacted parties have reviewed the work and due diligence has been exercised in locating embedded objects. This may require an engineering review or structural radar imaging. The final determination for whether engineering reviews or structural imaging is necessary is the responsibility of the asset owner (e.g. site, Dam Safety). Contact TVA Safety for further guidance or clarifications.
    f. Use TVA Form 17717 or equivalent to ensure all considerations have been met.
4. The responsible supervisor shall make every attempt to ensure any hidden hazards are identified and must also obtain the necessary hold orders before work is initiated.
5. Ensure adjacent or nearby sensitive equipment is identified and properly protected from dust.
6. Ensure that the person performing the drilling or chipping is properly protected from exposure to silica dust by using approved respiratory protection. Respiratory protection may not be required when dust is controlled by wet core drilling or other engineering controls. See TVA- TSP-18.913, Silica for information.
7. Ensure the person performing the drilling or chipping is wearing proper personal protective equipment. This includes eye protection (goggles and face shield), hard hat, hearing protection, and suitable work gloves.
8. Make an actual layout of the area to be drilled, chipped, or altered before the performance of the work.

9. Include all information required to locate the exact spot for drilling or chipping by relating to elevations, distance from column lines, and other location references used on plant drawings. Include a brief description of the work or job to be performed indicating the extent and depth of drilling or chipping required.
10. Use a drill stop device to interrupt power to the tool upon contact with an embedded object if work planning indicates a probability of such contact.
11. Immediately notify the unit operator of any incident resulting from the permitted work.
12. When marking the area to be drilled or chipped, independent verification must be used. If there is a discrepancy between the two verifiers, a supervisor shall be contacted.

20 Dropped/Falling Object Prevention

1. When working overhead where there is a potential for objects to be dropped or fall to a lower level and pose risk to personnel, implement measures to prevent dropped or falling objects and protect personnel. The checklist in this section may be used as a guide to identify conditions that may lead to dropped objects.
2. Maintain good housekeeping in the work area. Remove trash, scraps and debris regularly.
3. If possible, barricade the area below where fall or drop hazards may exist.
4. Consider the installation of canopies above workers who are exposed to falling/dropped objects.
5. Keep materials at least three feet from a leading edge, other than material required for work in process. Secure objects on elevated surfaces where feasible.
6. If tooling or material is stacked above the toe board, use panels or screens to prevent tolling ormaterial from falling though the guardrail to the area below.
7. Use tool lanyards/tethers to prevent tools from falling.
8. Do not hang objects over guardrails.
9. Ensure toe boards are in place when required.
10. Coordinate work with other work groups working below. Ensure workers below are aware of the work being performed overhead and are wearing hard hats and other required personal protective equipment.

	Tasks/Conditions with Risk of Dropped Objects
☐	Working on or over open grating or near floor or wall openings
☐	Working or storing equipment or materials near open guardrails (permanent or temporary)
☐	Working or storing equipment or materials near a stairwell (permanent or temporary)
☐	Working above walkways or aisles
☐	Working from scaffolding, mobile scaffolding platforms, or other overhead access equipment
☐	Assembling scaffolding, handling scaffold tubes, clamps or planks.
☐	Rigging or hoisting material, including the use of chain falls, rope and come-alongs.
☐	Working above electrical sensitive equipment, including over a foreign material exclusion area
☐	Storing material in or clearing material from an elevated area
☐	Setting up a temporary storage area
☐	Performing work in an elevated area
☐	Working in elevated outside area affected by wind or weather

21 Earbud/Headphone Usage

This section applies to personal earbuds or headphones designed for listening to music, podcasts and other applications (apps) from electronic devices. It does not apply to earmuffs or ear plugs designed as hearing protection which meet the required noise reduction rating of 28 NRR.

1. Do not wear earbuds/headphones in industrial or construction areas where their use may interfere with the ability to hear critical environmental sounds such as moving equipment/vehicles, heavy machinery and safety warning signals and alarms.
2. Do not use cell phones, including earbuds/headphones, to listen to music, podcasts or apps when using heavy equipment such as aerial lifts, forklifts, bulldozers, etc.
3. When wearing earbuds/headphones in office or administrative areas, adjust the volume to a suitable level that will not interfere with the ability to hear emergency alarms or perform work safely.

22 Electrical

Use the following Minimum Approach Distance Table for Minimum Approach Distances requirements referenced in this Manual.

MINIMUM CLEARANCE DISTANCE FOR ALL TYPE OF ENERGIZED WORK Elevations at or Below 3000 feet						
Nominal Voltage (kV) PHASE TO PHASE			**DISTANCE TO EMPLOYEE**			
			PHASE TO GROUND		PHASE TO PHASE	
			FT-IN.	METERS	FT- IN.	METERS
.050	to	0.300	AVOID CONTACT		AVOID CONTACT	
.301	to	.750	1-2	.33	1-2	.33
.751	to	5.0	2-1	.63	2-1	.63
5.1	to	15.0	2-2	.65	2-3	.68
15.1	to	36.0	2-7	.77	3-0	.89
36.1	to	46.0	2-10	.84	3-3	.98
46.1	to	72.5	3-4	1.00	4-0	1.20
72.6	to	121.0	3-9	1.13	4-8	1.42
121.1	to	145.0	4-4	1.30	5-5	1.64
145.1	to	169.0	4-10	1.46	6-5	1.94
169.1	to	242.0	6-7	2.01	10-2	3.08
242.1	to	362.0	11-3	3.41	18-2	5.52
362.1	to	420.0	14-0	4.25	22-5	6.81
420.1	to	550.0	16-8	5.07	27-1	8.24
550.0	to	800.0	22-7	6.88	37-5	11.38

22.1 Electrical - General

1. If it is necessary to work on energized lines or equipment for continuity of service, the final decision as to whether the job may be done safely is the responsibility of the supervisor who has direct charge of the work. The supervisor must ensure:
    a. Crew is properly trained for the work on energized equipment
    b. Proper tools and equipment are used
    c. Correct safety measures are taken
2. Maintain minimum approach distances as outlined in the table in this section.
3. Use insulating equipment (hot sticks, rubber gloves, etc.) that has been adequately tested.

4. Consider all electrical circuits and equipment energized until they have been properly isolated, tested, and grounded.
5. Obtain a caution order on any transmission line or substation equipment being worked while energized.
6. Employees performing energized work on the same structure shall not work on different phases at the same time.
7. Rubber gloves are not required to be used with hot sticks for hot line work.
8. While working or climbing nearer than 25 feet to energized 500-kV conductors or parts on transmission line structures, wear conductive-sole shoes and maintain contact between the soles of the shoes and the grounded portion of the structure. The use of static grounds is considered to provide the same protection as the use of conductive-sole shoes.
9. Workers at ground potential shall maintain minimum approach distance from conductors or energized parts, as indicated in this section.
10. While equipment, lines, or buses are energized, no employee at ground potential shall touch insulators, bushings, lightning arresters, or “Lee” pins except with protective equipment.
11. When untying energized conductors from insulators, keep the tie wire cut short enough so that it cannot reach any part of the supporting structure.
12. Before any energized equipment is worked on, consider the arc that will result if accidental short circuiting or grounding occurs, and plan accordingly.
13. Use only ropes that are maintained specifically for hot line work on energized lines or equipment.
14. Properly care for and store live line tools.
    a. Never place live line tools directly on the ground. Use special tool holders or tarpaulins for this purpose.
    b. Use a “hot stick” box or room, or canvas bags, waterproof boxes or trailers designed for live line tool storage.

22.2 Electrical Switching Operations

1. During normal plant operations, obtain permission from appropriate operations personnel before entering the switchyard. The appropriate operations personnel shall approve entry based on work requirements, operational conditions, and the safety considerations of the work to be done.
2. Supervisors shall ensure that employees under their supervision work within safe boundaries established by the clearance, and in accordance with the most current clearance procedures, practices, and operating letters.
3. Wear the appropriate arc resistant clothing and required personal protective equipment when conducting switching operations.
4. Install necessary barricades and barrier tape in accordance with the Signs and Barricades section of this manual.
5. During outages or heavy maintenance activities in the switchyard, the supervisor shall notify the appropriate operations personnel of work activities daily.
6. If switching becomes necessary while work is being performed in the switchyard, the appropriate operations personnel shall notify the supervisors and crews of the work being performed to evacuate the switchyard.
7. When operations personnel become aware of adverse weather that could cause breakers to open automatically, they shall notify the responsible supervisor to evacuate the switchyard.

22.3 Temporary Electrical and Use of Power Strips

1. When choosing temporary power equipment, ensure the right equipment for the job is selected. For example, choose cords rated for outdoor use for outdoor applications.
2. Except as specifically modified in this section, all requirements for permanent wiring found in NFPA 70 *National Electric Code, Article 590, Temporary Installations* shall apply to temporary wiring installations.

3. Temporary wiring methods are acceptable only if approved based on the conditions of use and any special requirements of the temporary installation.
4. Temporary electric power and lighting installations is allowed during:
    a. Construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.
    b. Emergencies and for tests, experiments, and developmental work.
5. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.
6. Suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all ungrounded conductors of each temporary circuit. Multiwire branch circuits shall be provided with a means to disconnect simultaneously all ungrounded conductors at the power outlet or panelboard where the branch circuit originated. Identified handle ties are permitted.
7. 480V splitters must be UL approved as a unit/system. Site assembled 480V splitters, even if made from UL approved components, are not permitted unless tested as a system by a nationally recognized laboratory.
8. All lamps for general illumination shall be protected from accidental contact or breakage by a suitable luminaire or lamp holder with a guard. Brass shell, paper-lined sockets, or other metal-cased sockets shall not be used unless the shell is grounded.
9. A box is not required for splices or junction connections where the circuit conductors are multiconductor cord or cable assemblies, if the equipment grounding continuity is maintained with or without the box.
10. A box, conduit body, or terminal fitting having a separately bushed hole for each conductor shall be used wherever a change is made to a conduit or tubing system or a metal-sheathed cable system.
11. Flexible cords and cables shall be protected from accidental damage. Sharp corners and projections shall be avoided. Where passing through doorways or other pinch points, protection shall be provided to avoid damage.
12. Flexible cords and cables entering enclosures containing devices requiring termination shall be secured to the box with fittings designed for the purpose.
13. Cable assemblies and flexible cords and cables shall be supported in place at intervals that ensure that they will be protected from physical damage. Support shall be in the form of staples, cable ties, straps, or similar type fittings installed so as not to cause damage. Vegetation shall not be used for support of overhead spans of branch circuits or feeders.
14. Ground fault protection for personnel for all temporary wiring installations shall be provided to comply with criteria found within this manual and NFPA 70 *Article 590*. This shall apply only to temporary wiring installations used to supply temporary power to equipment used by personnel during construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.
15. For wiring >600 volts, nominal, suitable fencing, barriers, or other effective means shall be provided to limit access only to authorized/qualified personnel.

22.4 Power Strips

1. Do not interconnect two or more (daisy chain) power strips with an extension cord or multiple power strips. Avoid daisy chaining by using a power strip with a power cord of adequate length to reach an outlet or moving desks and associated equipment to be closer to existing outlets.
2. Limit use to 15 amps. Power strips are not designed for high power loads such as space heaters, refrigerators, and microwave ovens. Use wall outlets for such high-power loads.
3. Inspect surge suppression devices on a regular basis. Devices without any visual or audible indication, as well as devices manufactured before 1998 shall be removed from service and properly disposed.
4. Use only power strips equipped with internal breakers/surge protectors for daily electrical use (e.g., computers, monitors).

5. Do not use extension cords in lieu of an internal breaker/ surge protected power strip.
6. When selecting an appropriate power strip/surge protector, consider:
    a. The amperage requirements of the devices to be energized.
    b. Length of power cord, typically ranging from 3-ft up to 20-ft. Avoid having too much excess cord.
7. Make sure the power strip is set on its base.
8. Check each power strip to make sure it is in good condition for use.
9. Do not install a power strip where it is suspended in mid-air by its power cord by the cords plugged into it. This results in excessive stress on electrical connections.
10. If you have bulky transformer plug assemblies, use a power strip that can accommodate these assemblies.
11. Only use NRTL approved devices.
12. Do not permanently mount a power strip to any facility surface, unless manufactured for that purpose.
13. In equipment racks, 120/208-volt utility power to rack-mounted instruments shall be via a special power strip specifically designed to be rack-installed.
14. If at any time the surge protector or power strip is hot to the touch, remove and replace the unit. The electrical load for this strip shall be evaluated for overloading prior to returning to service.
15. Do not locate a surge protector or power strip where the unit would be covered with carpet, furniture, or any other item that will limit or prevent air circulation or in any area where moisture is a concern.
16. To ensure proper and safe usage:
    a. Inspect extension cords, power strips and surge protectors before every use. Discard any cord that has exposed wires, cracks, or splices.
    b. Keep cords unwound and free of kinks when in use.
    c. Insert plugs fully into the outlet so that no part of the prong is exposed.
    d. Do not attempt to plug grounded (three-prong) cords into ungrounded (two-slot) outlets.
    e. Examine electrical wall outlets to ensure there are no cracks, breaks, or loose pins.
    f. Do not store boxes, bags and other combustible items in front of electrical outlets or on top of surge protectors. This is not applicable to office furniture or carpet over floor outlets.

22.5 Extension Cords

1. Use listed/approved (e.g. Factory Mutual (FM), Underwriters Laboratories (UL), etc.) extension cords or attachments.
2. Do not interconnect two or more (daisy chain cords. Obtain a cord adequate length to reach the equipment and outlet.
3. Extension cords shall be S, SO or STO types.
4. Extension cord attachments used on supplying equipment at more than 300 volts shall be of the skirted type or so designed that electrical arcs are confined.
5. Splices and taps in extension cords shall have molded or vulcanized insulation equivalent to that of the cord being spliced. Rosin-core electrical solder or compression connections shall be used to make wire-to-wire splices.
6. Extension cords shall be made of 3 or 4-conductor cables.
7. Extension cords shall be connected to fittings so that tension is not transmitted to joints or terminal screws when the cord is pulled.
8. Receptacles, cord connectors, and attachment plugs shall be constructed so no receptacle or cord connection will accept an attachment plug with a different voltage rating than that for which the device is intended.
9. Extension cords are for temporary use only and shall be protected from damage while in use.

10. Extension cords, welding leads, etc., shall not be substituted for an Electrical Safety Ground conductor (ESG). An ESG is controlled by the Clearance Procedure. All personnel shall be familiar with safety grounds and know not to handle them outside of clearance procedure scope of work.
11. When used across aisles or walkways, extension cords and welding leads shall be run overhead at a height not less than 7'-6". If this is not possible, then consider the following options in this order to prevent fraying and creation of tripping hazards:
    a. Run cords in low traffic areas such as along the edge of the wall or under tables.
    b. Use a cord strip protector or secure the cord to the floor with tape when running cords across traffic areas.
12. Do not use extension cords as a substitute for fixed wiring, attached to building surfaces, run through wall holes, or concealed behind building walls, ceiling, or floors.
13. Protect extension and service cords used outdoors from the elements.
14. Use Ground Fault Circuit Interrupters (GFCIs) as required.
15. Protect extension cords from damage when passing through restricted openings, around sharp corners or projections, near hot surfaces or chemicals, etc.
16. Do not remove, replace, or by-pass fuses, or reset circuit breakers in temporary electrical services which trip. Blown fuses or tripping of circuit breakers shall be referred to qualified and trained electrical personnel for evaluation and repair as needed.
17. Inspect extension cords prior to use for obvious damage or defects. When Ground Continuity Monitors (GCM) are utilized, the GCM shall have all lamps lit to be considered safe for use. GCM must be used as directed by the manufacturer and must show ground continuity for the cord set on which it is installed.
18. Remove extension cords from service if damaged and tag as defective equipment.
19. Test extension cords at least annually for continuity to ground and for short circuits. An annual test is not required if the cord has a functional GCM installed that is used in accordance with the manufacturer's instructions.
20. Use the annual color code banding prescribed in Color Coding/Inspections of Material and Equipment to identify inspected extension cords: Color Code banding is not required when utilizing a functional Ground Continuity Monitor for inspections in accordance with manufacturer's instructions.

22.6 Ground Fault Circuit Interrupters (GFCI)

1. There are two applications where ground-fault protection of equipment is intended to be used:
    a. Where there might be excessive ground fault leakage current from equipment
    b. Where equipment and conductors are to be protected from damage in the event of a higher-level ground fault (either solid or arcing).
2. These types of protective equipment are for use only on AC grounded circuits and cause the circuit to be disconnected when a current equal to or higher than its pickup setting or rating flows to ground.
3. Ground Fault Circuit Interrupters (GFCIs) shall:
    a. Be used with all 120-VAC portable lights and portable electrical tools wet, moist and in conductive environments
    b. Be permanently installed within 6-ft of all sinks.
    c. Be tested before being placed in service.
    d. Be used for permanently installed underwater inspection lights; and shall be tested monthly.
    e. Be removed from service and a defective equipment tag attached until repaired or discarded.
4. A GFCI shall be listed/approved (e.g. FM, UL, etc.) and used in accordance with its manufacturer's instructions.

5. Individual GFCI protection shall be provided for each branch circuit where ground fault protection is intended to be used as stated in #1 above.
6. When an electrical extension cord is used in a construction setting, the extension cord must:
    a. Be the type that has an internal GFCI, or.
    b. Be plugged into a power receptacle with an internal GFCI, or
    c. Be plugged into a portable GFCI that is plugged directly into the power receptacle.
7. If a temporary electrical power pack is used and the power pack has internal GFCI protection on its outlet power receptacles, an extension cord may be plugged directly into the protected receptacle.
8. If the temporary electrical power pack does not have internal GFCI protection on its power outlet receptacles, then a portable GFCI is required to be plugged into the receptacle and the extension cord plugged into the GFCI.
9. In addition to the maintenance specified for the individual types of GFCIs, tripping tests shall be performed with the test button on the unit in accordance with the frequency recommended by the manufacturer.
10. Separate test instruments are available that can be used for testing and troubleshooting GFCIs. Such testers shall be listed by a nationally recognized testing laboratory to UL 1436**,** Outlet Circuit Testers and Similar Indicating Devices. Separate GFCI test instruments shall not be used to test GFCIs protecting 2-wire circuits—doing so can result in electric shock.
11. When a separate GFCI test instrument is used, if the tester indicates “No Trip” and the GFCI integral test button indicates “Trip,” the following incorrect wiring scenarios shall be investigated:
    a. Line and load wires transposed
    b. Reverse polarity
    c. Open ground
12. The GFCI must be properly wired for the test result to be considered indicative of an improperly functioning GFCI.
13. For specific maintenance requirements, see the manufacturer’s literature for the specific GFCI.

22.7 Supplying Temporary Electrical Power

1. This section does not apply to permanent power installations using a Temporary Alteration Permit (TAP).
2. All electrical devices used in constructing temporary electrical wiring systems shall be listed/approved.
3. Splices and taps in conductors shall be made with molded or vulcanized insulation equivalent to the cord being spliced. Rosin-core electrical solder or compression connections shall be used to splice conductors within junction boxes.
4. Metal enclosures of energized electrical conductors shall be grounded.
5. Protect conductors routed through walls, doorways, and other pinch points from damage during use and storage. Route conductors over passageways or use floor bridges where possible.
6. Do not install wiring of any type in ducts used to transport coal dust, other stock, or flammable vapors.
7. Temporary wiring systems in areas containing coal dust, battery charging rooms, or in other areas where flammable gases/vapors may be present shall contain equipment rated for the class of hazard and be installed per the requirements of that class of hazard.
8. Dismantle and remove temporary wiring systems when no longer required.

22.8 Selection and Use of Temporary Lighting

1. Do not use fluorescent and Compact Fluorescent (CFL) bulbs. These contain a small amount of mercury and shall not be used in temporary light stringers.
2. Do not electrically load temporary lighting stringers beyond the manufacturer's specifications (maximum wattage) or wire size ampacity.
3. Do not plug electrical tools or appliances into a temporary light stringer.

4. Protect portable lamps for routine area lighting from accidental contact or breakage.
5. Protect bulbs with suitable fixtures or lamp holders with guards. Bulb sizes shall not negate the protection of the guard of the lamp holder. Where guards are not feasible, the fixture must be elevated at least 7'-6" ft. above the normal working surface.
6. Use a GFCI device with portable electric lighting used in areas that are wet, damp or moist; or where personnel will be working within grounded metal structures such as drums, tanks, and vessels.
7. Ensure exposed metal parts on 120-VAC lighting circuits are grounded.

22.9 Fuse Handling

1. When installing or removing expulsion-type fuses with one or both terminals energized and/or exposed at more than 50 volts:
    a. Use tools and/or gloves rated for the voltage.
    b. Wear arc-rated face shields over safety glasses that are appropriate for the hazard.
    c. Stay clear of the exhaust path of the fuse barrel.
2. When exposed to the hazards of electric arcs or electrical flames, do not wear clothing that will burn or melt. See TVA-TSP-18.1022, Arc Flash Protection.
3. When working within reach of energized conductors and equipment or operating equipment that is known to produce arcs, comply with the personal protective equipment requirements as specified in TVA-TSP-18.1022**,** Arc Flash Protection.
4. Do not wear clothing made of acetate, nylon, polyester, and rayon, either alone or in blends, unless the fabric is treated with an approved fire retardant and documented in test results from a recognized test authority.

22.10 Grounding

1. Only qualified electrical workers may apply protective grounds.
2. Outside of Transmission, all grounds must be selected and applied in accordance with TVA-TSP-18.1008, Temporary Protective Grounding for Generating Stations and other Non-Transmission Facilities. Transmission employees execute grounding in accordance with Business Unit procedures.

22.11 Guarding Energized Electrical Equipment

1. Guarding of spaces and rooms in which electrical supply lines or equipment are installed shall be restricted to authorized persons under any of the following conditions:
    a. If, under normal conditions, exposed energized parts at 50 to 150 volts (to ground) are located within 8-ft of the ground or other working surface inside the space or room (this does not include incidental conditions, such as broken or missing light bulbs).
    b. If energized parts operating at 151 to 600 volts are, under normal conditions, located within 8ft of the ground or other working surface inside the space or room are guarded only by physical location.
    c. If energized parts operating at more than 600 volts are located within the space or room and are not enclosed within grounded, metal-enclosed equipment whose only openings are designed so that foreign objects inserted in these openings will be deflected from the energized parts, or installed at a height above the ground or any other working surface that provides protection at the voltage to which they are energized corresponding to the protection provided by an 8-foot height at 50 volts.
2. Where access is restricted to authorized personnel only, access shall be controlled in the following manner:
    a. The spaces or rooms shall be enclosed with fences, screens, partitions, or walls to minimize the possibility that unqualified persons will enter.
    b. Signs shall be posted at each entrance to warn unqualified persons to keep out.

   c. Entrances to rooms and spaces that are not under the observation of an attendant shall be kept locked.
3. Guarding shall be provided around all energized parts operating at more than 50 volts (to ground) without an insulated covering, unless the location of the energized parts gives sufficient clearance to guard against accidental contact. Guidelines for clearances are contained in IEEE C2 National Electric Safety Code. Guarding of Energized Parts Within Compartments.
4. Except for fuse replacement or other necessary access by qualified persons, the guarding of energized parts within compartments shall be maintained during operations and maintenance functions to prevent accidental contact with energized parts and to prevent tools or other equipment from being dropped on energized parts.
5. When guards are removed from energized equipment, barriers shall be installed around the work area to prevent personnel who are not working on the equipment f inadvertent contact.

22.12 Jumpers

1. Only qualified and authorized employees will troubleshoot energized control circuits.
2. The use of jumper cables for troubleshooting shall be strictly controlled.
3. The responsible employee shall keep a log of jumper cable use to include:
   a. The circuit or component isolated by the jumper.
   b. The jumper identification number or code.
   c. The actual location of the jumper's use.
   d. The date the jumper was installed.
   e. The date it was removed.
   f. The person responsible for attaching and removing the jumper.
4. Each jumper will contain an identification number or code.
5. Jumpers will be designed for the voltage and current to be imposed on them.
6. Alligator clips shall have insulated covers.
7. Do not use jumpers attached by means of alligator clips to bridge the secondaries of in-service energized current transformers. A positive means must be used for attaching the jumper that bridges the secondary terminals.
8. Use care in attaching and removing jumpers so that short circuits are not created and there is no personnel contact with other energized circuits. Wear flame retardant clothing in accordance with TVA-TSP-18.1022, Arc Flash Hazard when performing this task.
9. On completion of work, return all equipment to a safe condition. Replace all enclosures such as panels, outlet covers, conduit covers, etc., and tighten all bolts/screws. Close and latch electrical panel doors.
10. Remove all grounds and/or jumper cables when work is completed.
11. The clearance and hold order shall be removed in accordance with the TVA-TSP-18.613, Clearance Procedure to Safety Control Hazardous Energy Using Group Tagout when the work has been completed and the equipment returned to a safe condition.

22.13 Portable and Vehicle Mounted Generators

1. Portable and vehicle-mounted generators, used to supply power to cord and plug-connected equipment, shall meet the following requirements:
   a. The generator shall 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 noncurrent-carrying metal parts of 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.

22.14 Safe Distribution Systems

1. Branch circuits shall originate in a distribution cabinet or panel board approved for the specific environment where it is located. Covers for the cabinets or control panels shall be appropriately labeled.
2. Branch circuits shall include a separate equipment grounding conductor that is connected to a grounding system. The grounding conductor will be equal in size and insulation to the load conductors.
3. Bare conductors and conduit will not be used for branch circuit grounding.
4. Branch circuits will be protected with overload devices of the appropriate current rating.
5. Branch circuit conductors will be rated for at least 600 volts.
6. Each switch, ground fault circuit interrupter (GFCI), over-current device, and receptacle will be identified or arranged in such a manner to indicate the circuit it supplies.
7. Use attachment plugs or other connectors that are designed to confine electrical arcs when 300 volts or more is to be distributed.
8. Junction boxes, switch panel boxes, and conduits will be fitted with covers. Covers shall remain in place except for inspection and maintenance functions.
9. Bushings will be used to protect wiring entering or leaving electrical boxes.
10. Power distribution centers will be used whenever extension cord runs of >200-ft are required to be used with a large number of portable electrical tools.

22.15 Working On or Near Energized Lines or Equipment

1. If necessary to work on energized circuits or equipment for continuity of service, the final decision as to whether the job may be done safely is the responsibility of the supervisor who has direct charge of the work. It is his or her responsibility to know that his or her crew is:
    a. Properly trained for the work on energized equipment that the proper tools and equipment are used.
    b. Tools and equipment have been tested and are safe.
    c. Correct safety measures are taken.
2. At least two qualified employees are required to be present while the following types of work are performed on exposed electrical circuits or equipment energized at more than 600 volts:
    a. Installation, removal, or repair of de-energized lines if an employee is "exposed to contact" with other circuit parts energized at more than 600 volts. The term "exposed to contact" is meant to apply to an employee who is in a working position from which he/she can reach or move a conductive object within the electrical component of minimum approach distances in the minimum approach distances table in this section.
    b. Installation, removal, or repair of energized equipment such as, but not limited to, transformers, capacitors, and regulators.
    c. Work involving the use of mechanical equipment other than insulated aerial lifts near energized parts. The term "near" as it applies to non-insulated mechanical equipment that due to its working position can physically contact the energized electrical circuit in question. The contact may be due to either:
    d. Inadvertent movement of the equipment to a point within the minimum approach distances (human error) or
    e. Mechanical failure of the equipment causing the equipment to move to a point within the minimum approach distances.
    f. Other work that exposes an employee to electrical hazards equal to or greater than those posed by the operations described above.

3. The following activities are exceptions to the two-person rule and can be safely performed by a single qualified employee.
    a. Routine switching of circuits where previous experience demonstrates that the conditions present permit the work to be performed safely.
    b. Work performed with live-line tools if the employee is so positioned as to be neither within reach nor otherwise exposed to contact with energized parts.
    c. Emergency repairs to the extent necessary to safeguard the general public, recognizing that the loss of power can create public safety concerns that outweigh the safety concerns of individual employees as it applies to the two-person rule. Once the emergency to the general public is abated, the two-person rule applies to the remainder of the work.
4. In accordance with OSHA regulatory requirements, when employees are performing work on, or associated with, exposed lines or equipment energized at 50 volts or more, persons with first- aid training shall be available as follows:
    a. For fieldwork involving two or more employees at a work location, at least two trained persons shall be available. However, for line-clearance tree trimming performed by line-clearance tree trimmers who are not qualified employees, only one trained person need be available if all new employees are trained in first aid within 3 months of their hiring dates.
    b. For fixed work locations such as substations and generating stations, the number of trained persons available shall be sufficient to ensure that each employee exposed to electric shock can be reached within 4 minutes by a trained person. However, where the existing number of employees is insufficient to meet this requirement (at a remote substation, for example), each employee at the work location shall be a trained employee.
5. Treat noncurrent-carrying metal parts of equipment or devices, such as transformer cases and circuit breaker housings as energized at the highest voltage to which they are exposed unless verified as grounded before work is performed.
6. Do not perform maintenance, modification and construction work on electrical circuits and equipment until:
    a. Proper authorization has been obtained
    b. It has been determined that the work can be done in a safe manner
    c. The safe work requirements are clearly understood by each person involved in the work.
7. Remove all exposed conductive articles such as keys watches and jewelry when work is performed within arm’s reach of, or potential contact with exposed energized parts.
8. Nonmetal framed glasses are preferred. You may wear a non-conductive face shield or non-conductive safety glasses over metal framed glasses.
9. Restrain badges/lanyards by taping or other means to the worker's clothing to prevent contacting an energized source. Removal of badges/lanyards that have the potential to contact energized electrical circuits is also acceptable.
10. Take measures to insulate adjacent equipment so that no arc flash potential/shock exists OR establish a boundary area as appropriate.
11. Use insulated hand tools constructed in accordance with ASTM F1505 and/or with IEC Standard 60900 Live Working-Hand tools for use **up to** 1,000 VAC. and 1,500 VDC. Uninsulated tools may not be modified by means such as electrical tape and be considered insulated for working on energized parts.
12. Use insulated hand tools to manipulate exposed energized parts operating at greater than 50 volts up to 1,000 volts.
13. The use of insulated hand tools does not eliminate the need to use voltage rated gloves or other insulating barriers where an employee may accidentally contact exposed energized conductors/parts operating at 50 volts or more. For example, if an employee's hand that was not using the insulated tool, rubber-insulating gloves would be required.

14. Only electrically qualified employees may work on exposed, uninsulated energized electrical lines, conductors, or equipment.
15. Only qualified employees may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more.
16. Consider electrical lines and equipment energized unless properly cleared and verified as required by TVA-TSP-18.613, Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout or business unit specific clearance procedures.
17. No employee shall approach or take any conductive object closer to exposed energized parts than set forth in the Minimum Clearance Distance for all Type of Energized Work except when:
    a. The employee is insulated from the energized part, or
    b. The energized part is insulated from the employee and from any other conductive object at a different potential, or
    c. The employee is insulated from any other exposed conductive object, as during the performance of live-line barehanded work.
18. The table at the beginning of Section 22 of this manual establishes the safe distances to which persons may approach or take conductive objects to exposed energized conductors/parts.

22.15.1 Access and Working Space/Working Position

1. Sufficient access and working space shall be provided and maintained around electric equipment to permit ready and safe operation and maintenance of such equipment.
2. Do not use working space for storage. When normally enclosed energized parts are exposed for inspection or servicing, guard the working space if in a passageway or open space.
3. At least one entrance shall be provided to give access/egress to the working space around the electrical equipment.
4. The working space in the direction of access to energized parts operating at 600 volts or less which require examination, adjustment, servicing, or maintenance while energized shall be not less than indicated in the table below, *Working Space Around Equipment - 600 Volts or Less*. In addition to the dimensions shown in the table below, the working space shall be not less than30-in. wide in front of the electric equipment. Distances shall be measured from the energized parts if they are exposed or from the enclosure front or opening if such are enclosed. Concrete, brick, or tile walls shall be considered grounded.

Working Space Around Equipment - 600 Volts or Less

Working Space around Equipment - 600 volts or less						
Nominal Voltage to Ground	**Minimum Clear Distance for Condition**					
	Condition A		Condition B		Condition C	
	Feet	Meters	Feet	Meters	Feet	Meters
0 - 150	3.0	0.9	3.0	0.9	3.0	0.9
151 - 600	3.0	0.9	3.5	1.0	4.0	1.2
Condition A - Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.						
Condition B - Exposed live parts on one side and grounded parts on the other side.						
Condition C - Exposed live parts on both sides of the workspace (not guarded as provided in Condition A) with the operator between.						

5. Working space shall not be required behind the assemblies, such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.
6. Working space for over 600 volts shall be in accordance Minimum Clearance Distance for all Type of Energized Work. The Minimum Clearance Distances for all types of energized work can be found in Section 22 of this manual.
7. To the extent that other safety-related work conditions permit, do not perform work in a position from which a slip or fall will cause contact with exposed uninsulated parts energized at a different potential than the person performing the work.
8. Perform, entry into electrical manholes over 4-ft deep and into unvented cable tunnels, cable chases, and cable/transformer vaults and any other location meeting the definition of a confined space in accordance with TVA-TSP-18.801, Confined Space Entry. Station an attendant outside the space if the work involves energized circuits with voltages greater than 50 volts. Ensure a communication system is in place to make contact between the attendant and the worker inside the confined space.
9. Use a ladder or other climbing device to enter and exit a manhole or subsurface vault exceeding 4-ft in depth. Never climb into or out of a manhole or vault by stepping on cables and handlers.
10. Use equipment capable of supporting the weight of the material to lower or retrieve materials and tools into manholes or vaults. Check the equipment for defects before use. Stay clear of the area directly under the opening of the manhole or vault when equipment, materials, or tools are being lowered or removed.
11. Maintain metallic sheath continuity or treat the cable sheath energized when work is performed on cables in manholes (or buried cable).

22.15.2 Underground Locations Containing Multiple Cables

1. When multiple cables are present in the work area, identify the cable to be worked on by electrical means, unless its identity is obvious because of distinctive appearance, location, or unique identification.
2. Protect cables other than those being worked on from damage.
3. Inspect energized cables that are to be moved for defects prior to moving them.
4. Where a cable in a manhole has one or more abnormalities that could lead to or be an indication of an impending fault, de-energize the defective cable before any employee works in the manhole, except when service load conditions and a lack of feasible alternatives require that the cable remain energized. In the latter case, employees entering the manhole will be protected from the possible effects of a failure by shields or other devices that are capable of containing the adverse effects of any anticipated fault.
5. Treat abnormalities such as oil or compound leaking from cable or joints, broken cable sheaths or joint sleeves, hot localized surface temperatures of cables or joints, or joints that are swollen beyond normal tolerances as an indication of an impending fault.

22.15.3 Connections and Disconnections

1. When connecting de-energized equipment or lines to an energized circuit by means of conducting wire or devices, make the first connection to the de-energized part.
2. When disconnecting equipment or lines from energized circuits by means of conducting wires or devices, disconnect the source end first.
3. Keep loose conductors away from exposed energized parts during connection and disconnecting work involving energized circuits.

22.15.4 Materials Storage Near Energized Parts / Lines

1. In areas not restricted to qualified employees only, do not store materials or equipment closer to energized lines or exposed energized parts of equipment than the following distances plus an amount providing for the maximum sag and side swing of all conductors and providing for the height and movement of material handling equipment
    a. For lines and equipment energized at 50 kV or less, the distance is 10-ft.
    b. For lines and equipment energized at more than 50 kV, the distances are 10-ft plus 4-in for every 10 kV over 50 kV.
2. In areas restricted to qualified employees, do not store material within the safe working space required to be maintained around energized lines or equipment.

22.15.5 Live Dead Live

1. To ensure absence of voltage or an electrically safe working condition, a Live-Dead-Live check shall be performed.
2. To perform Live-Dead-Live (LDL) checks three steps must be performed in both high voltage (greater than 480 VAC) and low voltage (equal to or less than 480 VAC).
3. For high voltage (greater than 480 VAC):
    a. LIVE - Check the functionality of the electrical testing apparatus on a known energized voltage source or a voltage test source purchased from the same manufacturer of the electrical testing apparatus to verify that the electrical testing apparatus is operational. This check also verifies that the electrical testing apparatus's test probes and test leads are functional.
    b. DEAD - Use the electrical testing apparatus to check and verify whether the circuit and/or equipment to be worked on is de-energized.
    c. LIVE - As a last check to verify the electrical testing apparatus did not fail during the circuit testing, check the electrical testing apparatus again using the known energized voltage source or a voltage test source purchased from the same manufacturer of the electrical testing apparatus.
4. For low voltage (equal to or less than 480 VAC):
    a. LIVE - Check the functionality of the electrical testing apparatus on a known energized voltage/current source or a voltage test source purchased from the same manufacturer of the electrical testing apparatus to verify that the electrical testing apparatus is operational. This check also verifies that the electrical testing apparatus's test probes and test leads are functional.
    b. DEAD - Use the electrical testing apparatus to check and verify whether the circuit and/or equipment to be worked on is de-energized.
    c. LIVE - As a last check to verify the electrical testing apparatus did not fail during the circuit testing, check the electrical testing apparatus again using the known energized voltage/current source or a voltage test source purchased from the same manufacturer of the electrical testing apparatus.
5. In cases where both AC and DC voltage may need to be verified, the Live-Dead-Live (LDL) check process may have to be repeated twice, so that the user can verify that the electrical testing apparatus is operating properly for both types of voltage.
6. Follow the manufacturer’s instructions for the apparatus being used, including whether to use the auto range function or select a specific voltage.

22.15.6 Vehicle Operations

1. Vehicles and mechanical equipment operated by a qualified employee shall be operated so that the minimum approach distances are maintained from exposed energized lines and equipment.
2. Ensure a designated employee other than the equipment operator observes the approach distance to exposed lines and equipment.
3. Give timely warning before the minimum approach distance is reached unless it is certain that the operator can accurately determine that the minimum approach distance is being maintained.

4. If, during operation of vehicle equipment, the equipment could become energized, comply with at least one of the following requirements:
    a. Cover the energized lines exposed to contact is with insulating protective material that will withstand the type of contact that might be made during the operation, or
    b. Ensure the equipment is insulated for the voltage involved and positioned the equipment so that its uninsulated portions will not approach the lines or equipment closer than the minimum approach distances specified in this section.
5. Where the vehicle could become energized in the conduct of work operations, use the following protective measures:
    a. Use appropriate vehicle grounds identified by green color-coding.
    b. Bond the vehicle to the best available ground source.
    c. Bond equipment together to minimize electrical potential differences.
    d. When available, utilize ground mats to extend areas of equipotential.
    e. Use insulating protective equipment or barricades to guard against any remaining hazardous potential differences.
    f. Do not store or dispense flammable gas or liquids under high-voltage lines.
    g. Cranes and other mobile equipment shall not be parked (when not in use) or refueled under energized high-voltage lines.
    h. If it is necessary in an emergency to leave equipment in contact with energized high-voltage lines, jump, do not step, from the equipment to the ground.
    i. In generating plants, signs shall be posted in accordance with the Signs and Barricades section of this manual where equipment would travel beneath high-voltage lines. The signs shall indicate the line voltage and the line height above the ground.

22.16 Wet Cell Storage Batteries

1. When servicing or changing batteries or responding to a spill, wear appropriate PPE. At a minimum, this includes face shields, chemical goggles, rubber gloves, and rubber aprons or rain suits manufactured of the proper materials.
2. Do not change batteries unless you have received proper training.
3. Ensure emergency eyewash and safety showers are available and operational in accordance with the Emergency Showers and Eyewash section of this manual.
4. Use thermometers when taking electrolyte cell temperature. Do not use mercury thermometers.
5. Keep cell vent plugs firmly in place at all times except when adding water or making hydrometer readings. Vent plugs shall be the flame-arrester type.
6. Use tools with insulated handles for tightening connector bolts.
7. Remove rings, wristwatches, etc. before working on the battery.
8. Facility mounted or portable material handling equipment shall be provided and used when changing batteries.
9. Do not smoke, create open flames or weld in battery charging areas.
10. Keep tools and metal objects off the top of the batteries to avoid short circuits.
11. Inside Battery Rooms requirements are as follows:
    a. Inside battery charging shall maintain sufficient ventilation to ensure diffusion and prevent accumulation of hydrogen. Natural ventilation, located near the roof of such rooms, or powered ventilation shall be used. Otherwise, such rooms will be classified as
    b. Class I, Division II areas and electrical lighting and fixtures provided to meet that classification.
    c. Electrical wiring, conduit, and boxes shall resist corrosion. Aluminum or zinc coated, and corrosive protected steel shall be used. Battery racks shall be treated for corrosion resistance or be constructed of fiberglass.

d. Racks are rigid frames designed to support cells or trays. They shall be substantial and be made of one of the following:
    i. Metal, treated so as to be resistant to deteriorating action by the electrolyte and provided with non-conducting members directly supporting the cells or with continuous insulating material other than paint on conducting members
    ii. Other construction such as fiberglass or other suitable non-conductive materials
e. Trays shall be constructed or treated to be resistant to deteriorating action by the electrolyte.
f. Only authorized and qualified personnel shall be allowed inside battery storage rooms. Signs shall be posted at the entrance prohibiting unauthorized entry and access shall be strictly controlled.
g. Floors shall be of acid resistant construction unless protected from acid accumulations.
h. Battery rooms shall be clean and kept dry.
i. Sufficient workspace shall be provided for inspection and maintenance.

12. In forklift and other vehicle battery charging areas, the following requirements apply:
    a. Designate areas for charging of forklift and other vehicle batteries. Ensure signs identify these locations and prohibit smoking and open flames in these areas.
    b. Ensure areas are ventilated, provided with facilities for flushing or neutralizing spilled electrolyte, and provided with some means of fire protection. At least one fire extinguisher mounted in the area will satisfy this requirement.
    c. Protect battery charging apparatus from damage that may occur from the forklift or vehicle.
    d. Ensure that vent caps are functioning. Open the battery (or compartment) cover(s) to dissipate heat.
    e. Locate single-panel charging installations serving one or two trucks so readily ignited material are not located closer than 20-ft from the truck or the charging equipment. Do not place electrical chargers within storage racking.
    f. Locate multiple-panel battery-charging installations serving more than two trucks in a separate area along an exterior wall (a cut off room is preferred). Include the following features:
        i. Maintain a minimum space separation of 20-ft between any combustibles and the battery chargers, if they are not located in a cut-off room or locate the battery charges within a cut-off room with fire rated walls.
        ii. Provide automatic sprinklers designed to deliver an OH-2 density.
        iii. Provide natural ventilation at high points in the exterior walls or roof.
    g. In occupancies where lint, combustible dust, and filings may be present, locate battery-charging equipment in a separate room with positive pressurization arranged so the buildup of these materials about the charging equipment can be minimized.
13. When connecting or disconnecting batteries:
    a. Check all switches and any other current drawing devices of the equipment or vehicle and ensure they are in the OFF position.
    b. Clear bystanders from the area of the battery.
    c. Disconnect the grounded cable first; then disconnect the positive cable. After replacing and securing the battery, connect the positive cable first, then the grounding cable.
    d. Tighten each battery post cable connection before proceeding to the next step.

23 Elevators

1. Use elevators for their designed purpose.
2. Do not exceed the elevator capacity.
3. During emergencies, elevators are to only be used by emergency responders.
4. When transporting hazardous materials, ensure exposure to employees is minimized.

5. Do not attempt to leave a stalled elevator car. The emergency alarm or telephone shall be used to report the problem.
6. Do not hold elevator hoist way doors open by obstruction or by emergency stop switch unless an emergency has occurred.
7. The elevator pit shall be fully enclosed, and all entrances locked.
8. A job site representative shall be assigned to any contractor performing elevator maintenance and repairs in accordance with TVA-SPP-18.004, Contractor Safety Management.
9. DANGER signs shall be posted on the crossheads at the top of each hoist way indicating the clearance distance between the top of the car and hoist way ceiling.
10. When an elevator is in normal operating service, the elevator penthouse (control room) doors shall be kept locked and only authorized persons are permitted entry.
11. Do not use dumbwaiters for the transport of personnel.
12. All hoist way doors shall be barricaded and have warning signs affixed when being repaired.
13. Affected elevator call buttons on each landing shall be completely covered with a warning sign or tag, which states: **DO NOT OPERATE.**
14. The elevator inspection mode switch shall be used when making shaft inspections.
15. Plant/facility clearance procedure/lockout/tag out shall be implemented for any work in the penthouse, pit, or shaft involving circuitry or moving machinery. It is permissible to troubleshoot the control or power circuitry, when necessary, while the circuitry is energized.
16. If control circuitry permits, the elevator car shall be in the up-travel direction before any work is performed underneath the car.
17. At least two stop switches, excluding the emergency stop switch inside the car, shall be used (deenergized) while performing work in the shaft.
18. Plant/facility clearance procedure/lockout/tag out shall be implemented on the main power disconnect in the penthouse or on the main breaker feeding the penthouse disconnect before any work is performed underneath the car.
19. Any work in the pit which requires the car to be energized and traveled, shall be reviewed and approved by the supervisor in charge of the crew performing the work. As a minimum, a positive means to stop the car from contacting employees shall be used.
20. Elevator safety devices or electrical protective devices shall be made inoperative only as necessary for the duration of required inspection, test, or maintenance.
21. Sites or facilities where elevators are located shall ensure that a program or process is implemented to include:
    a. Requirements for monthly inspections.
    b. Documentation of corrective actions (maintained on file).
    c. Record of all elevator downtime complete with identification of cause for downtime, and corrective actions.
    d. Requirement for elevator records and files to be maintained on-site for review by certified elevator inspectors.
    e. A process for performing and documenting monthly preventative maintenance
    f. Ensuring elevators that have been repaired are repaired by a certified elevator technician.
    g. Ensuring elevators are inspected by a certified elevator inspector.
    d. TVA Form 7476. Electric Elevators Inspection or TVA Form 7476A, Hydraulic Elevators Inspection, or a method that includes a minimum of the information on these forms shall be used to document formal inspections.

24 Event Reporting (Reporting Injuries)

1. Reporting of safety related events (injuries, illnesses, near misses, safety suggestions or good catches) is conducted in accordance with TVA-SPP-18.013, Safety Event Reporting and Investigations.
2. All work-related injuries and illnesses, vehicle accidents, property/equipment damage and near miss events, regardless of severity, shall be entered into Cority within 24 hours of learning of the event. This includes "report only" events as defined in TVA-SPP-18.013, Safety Event Reporting and Investigations. Cority reporting links are located on the TVA Today home page and on the TVA Safety SharePoint site. For employees in remote locations without internet access, the supervisor shall be contacted for entry.
3. Reporting of good catches and safety suggestions is strongly encouraged using Cority.
4. All TVA employees and Staff Augmented personnel with TVA network login credentials may enter a report in Cority. Others may contact their TVA representative for assistance.

25 Excavation and Trenching

1. Work in transmission related to excavation and trenching shall comply with Transmission specific procedures.
2. Excavations, including boring, on or near earth dams require coordination with TVA Dam Safety.
3. When doing minor excavations on TVA property and the excavation will be hand dug or hand inserted, such as planting flowers and trees, digging for a fence post, inserting geotechnical probes, etc., AND there is no reason to expect buried or embedded systems or a location of these embedded systems has already been performed, TVA Form 29205 is not required. In instances where the TVA Form 29205 is not necessary, Business Units or Sites may have requirements in place that require reviews before digging (dam safety considerations, environmental reviews, engineering reviews, etc.)
4. Prior to beginning any excavation except as noted in #3 above, the responsible TVA foreman/supervisor shall initiate an Excavation Permit, TVA Form 29205. The permit shall include the following information:
    a. Part A - Permit and Excavation Approval.
    b. Part B - Permit and Excavation Final Closure.
    c. A description of the work to be performed.
    d. Exact location of the excavation and the embedded systems such as piping, electrical conduit, etc., that are to be located and marked.
    e. The hold order numbers on systems that have to be deenergized because they are located in or near the excavation.
    f. Any drawings or sketches needed to locate these embedded systems.
5. The TVA foreman/supervisor shall complete and sign the permit and post the permit at the excavation site.
6. Before beginning the actual excavation, the TVA foreman/supervisor shall ensure the following actions have been taken:
    a. The excavation area has been checked for embedded pipes and other utilities and their locations identified and marked.
    b. Pipes/utilities (including overhead power lines which could be contacted by excavation equipment) are deenergized/blanked off and necessary hold orders are in effect.
    c. Heavy equipment being used in the excavation is properly grounded by qualified electrical personnel if there is potential for contacting underground energized lines or the potential is unknown due to inability to locate.

7. Excavations that are 24 inches or less in depth with no hazards to the employee and the employee's head will not break the plane of the excavation, a competent person is not required as employee exposure is not reasonably anticipated.
8. Except in circumstances that meet the criteria of #7 above, a competent person shall be designated and trained to evaluate and monitor all excavation work **where employees will enter the excavation**. The competent person must be able to demonstrate the following:
    a. Training, experience, and knowledge of soil analysis, use of protective systems, and requirements of 29 CFR Part 1926 Subpart P.
    b. Ability to detect conditions that could result in cave-ins, failures in protective systems, hazardous atmospheres, and other hazards including those associated with confined spaces.
    c. Authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.
9. Before employees are allowed to enter an excavation over four (4) feet deep, the competent person shall ensure the following conditions have been addressed:
    a. The shoring/shielding or sloping systems meet requirements.
    b. Evaluation of the excavation for potential oxygen deficiency or hazardous atmospheres See TVA-TSP-18.801, Confined Space Entry for requirements for testing anatmosphere. This does not make the excavation or trench a confined space, but atmospheric testing is performed in accordance with the atmospheric testing requirements in the confined space procedure.
    c. Adequate means of egress are provided at least every 25 feet within the excavation, i.e., ladders, steps, or ramps. Ladders must be secured and extend a minimum of 36 inches above the landing.
    d. Adequate warnings, barricades, or stop-logs provided if mobile equipment is to be operated adjacent to the excavation.
    e. Excavated material and equipment positioned at least two (2) feet from the edge of the excavation and/or otherwise restrained from falling into the excavation.
    f. Adequate barricades and warning signs provided in proximity to pedestrians or vehicle traffic. Wear warning vests or other suitable garments marked with reflectorized material.
    g. A designated flag person is provided when moving vehicles are present
    h. Standard guardrails provided when employees have to cross the excavation by bridge or ramp or when they must work near the edge of the excavation.
    i. Adequate precautions are being taken to control water accumulation.
    j. A registered professional engineer has been consulted if any of the conditions in #11 below apply.
10. The designated Competent Person must determine:
    a. If any surface obstacles need to be removed or supported.
    b. What protective measures are appropriate to the site, i.e., sloping or shoring/shielding to protect employees and property.
    c. The soil classification to ensure the adequacy of sloping or shoring/shielding.
    d. Whether the excavation protective systems will require approval or a design by a registered professional engineer.
    e. Whether the excavation will require testing/monitoring for oxygen deficiency or flammable/toxic atmospheres.

11. A registered professional engineer (PE) must evaluate and approve the excavation design and sign the permit if any of the conditions below apply. At least one copy of the design shall be maintained at the job site during the construction of the excavation protective system. The design(s) will remain with the excavation permit and shall identify the registered PE.
    a. When using a sloping protective measure or shoring/shielding protective measures **NOT** specified by OSHA 1926.652.
    b. When the excavation exceeds 20 feet in depth. This does not apply to boring if personnel will not enter.
    c. Any excavation or boring adjacent to or beneath any structure or foundation such that the stability of the structure could be affected.
12. Protective measures must be taken when power excavating machines, e.g., backhoes, can contact an energized electric circuit, exposed or concealed, as follows:
    a. Ground the excavating machine with a temporary protective ground installed.
    b. Use a portable ground mat that is bonded to the machine for the operator to stand on, if the operator must stand on the ground while operating the machine. The bonded mat protects the operator from differences of potential.
    c. Use barricades to guard against hazardous differences in electrical potential that could develop at the machine or a driven ground rod.
    d. Employees must be briefed on the permit, work procedures, special hazards, and required personal protective equipment (PPE).
    e. When an excavating machine is operating and grounded, employees (not including the operator) are instructed to remain outside barricades 10 ft from a grounded machine, a driven ground rod(s), or other grounding connection point).
13. Crossings are permitted only under the following conditions:
    a. Vehicle crossings must be designed by and installed under the supervision of a registered professional engineer.
    b. Walkways or bridges must be provided for foot traffic. These structures shall have a safety factor of 4, have a minimum clear width of 20 inches, be fitted with standard rails, and extend a minimum of 24 inches past the surface edge of the trench.
14. The following steps shall be taken to prevent vehicles from accidentally falling into the trench:
    a. Barricades must be installed where necessary.
    b. Hand or mechanical signals must be used as required.
    c. Stop logs must be installed if there is a danger of vehicles falling into the trench.
    d. Soil shall be graded away from the excavation
15. Employees shall not be permitted to work in hazardous and/or toxic atmospheres.
16. Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Standard guardrails shall be provided where walkways are 4 feet or more above lower levels.
17. If an excavation undercuts a structure/sidewalk foundation, a registered professional engineer shall design/approve shoring or stability of the structure in question.
18. If the sloping of the excavation sides cannot be one and one-half to one vertical (34 degrees), then sloping or shoring protective systems options require that the soil type be evaluated and classified according to the type of soil. However, no employees may enter the excavation until protective systems are in place.
19. If sloping is selected as the protective system, option one under 29 CFR 1926.652(b) does not require soil classification since a 34° slope is considered to be the maximum allowable slope for the most unstable of soils.
20. If shoring or shielding is selected as the protective system, the soil type must be tested and classified as type A, B, or C and one of the four options in 29 CFR 1926.652(c) specified. ***Options three or four in 29 CFR 1926.652 (c) require design/approval by a registered professional engineer.***

21. Employees shall not work in excavations when there is accumulated water, or in excavations where water is accumulating, unless adequate precautions have been taken to protect employees against the hazards. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by the competent person to ensure proper operation.
22. Trenches shall be inspected by the competent person after each rain and before employees are permitted to re-enter the trench.
23. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The competent person shall sign and date the inspection log portion of the permit after each inspection.
24. Hydraulic shoring shall be checked at least once per shift for leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, and any other damaged or defective parts.
25. Underpinning shall be conducted only under the direction and with the approval of a registered professional engineer.
26. When using trench boxes:
    a. Employees are not allowed in the trench box when being installed, removed or moved vertically.
    b. Shields may not be subjected to loads exceeding system design.
    c. The box shall extend at least 18 inches above the surrounding area if there is sloping toward excavation.
    d. Earth excavation to a depth of 2 feet below the shield is permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench and there are no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system. Conditions of this type require observation on the effects of bulging, heaving, and boiling as well as surcharging, vibration, adjacent structures, etc., on excavating below the bottom of a shield.
27. The designated competent person shall complete the training course LMS 00059119, Excavating and Trenching - (Competent Person*)* Sloping Excavated Soil
28. Maximum allowable slopes for excavations less than 20 feet based on soil type and angle to the horizontal are as follows:

Maximum Allowable Slopes		
Soil Type	**Horizontal/Vertical Ratio**	**Slope Angle**
Stable Rock	Vertical	90 °
Type A	¾:1	53 °
Type B	1:1	45 °
Type C	1½:1	34 °
Type A (short term) Maximum depth 12 feet	½:1	63 °

25.1 Benching

1. As a general rule, the bottom vertical height of the trench must not exceed 4 feet for the bench.
2. Subsequent benches may be up to a maximum of 5 feet vertical in Type A soil and 4 ft in Type B soil to a total trench depth of 20 feet.
3. All subsequent benches must be below the maximum allowable slope for that soil type. For Type B soil, trench excavation is permitted in cohesive soil only.

25.2 Spoil (Temporary and Permanent)

1. Temporary spoil must be placed no closer than 2 feet from the surface edge of the excavation, measured from the nearest base of the spoil to the cut. This distance shall not be measured from the crown of the spoil deposit. This distance requirement ensures that loose rock or soil from the temporary spoil will not fall on employees in the trench.
2. Spoil shall be placed so that it channels rainwater and other run-off water away from the excavation.
3. Spoil shall be placed so that it cannot accidentally run, slide, or fall back into the excavation.
4. Permanent spoil shall be placed some distance from the excavation. The improper placement of permanent spoil, i.e., insufficient distance from the working excavation, can cause an excavation to be out of compliance with the horizontal to vertical ratio requirement for a particular excavation. This can usually be determined through visual observation. Permanent spoil can change undisturbed soil to disturbed soil and dramatically alter slope requirements.

25.3 Job Completion and Documentation

1. After the job is completed, the foreman/supervisor shall ensure that:
    a. Changes or additions to existing embedded pipes, utilities, etc., have been surveyed and documented on plant/site drawings.
    b. Protective shoring if used, is removed starting at the bottom of the excavation in accordance with the manufacturer's instructions, registered engineer's design, and competent person's recommendations.
    c. The excavation is immediately backfilled.
    d. The foreman/supervisor shall complete and sign the permit and send the permit along with any corrected drawings to the responsible manager. The completed permit shall be kept on file for a minimum of six months after completion of the work. The corrected drawings shall then be sent to plant/site engineering.

26 Explosives and Blasting

1. The Management Official In-Charge (MOIC):
    a. Shall authorize in writing the storage or handling of >10,000-lb. of explosives on site.
    b. Is responsible for implementing and enforcing the requirements related to explosives and blasting.
2. The Blasting Contractor Supervisor is responsible for all explosives handling, blasting operations, and adhering to the requirements of NFPA 495, Explosives Material Code.
3. A person of proven experience and ability in blasting operations shall direct the transportation, handling, storage, and use of explosives and blasting agents.
4. The driver of any vehicle used to transport explosives and helper assigned shall be physically fit, and able to read English and understand instructions.
5. No person shall be allowed to handle or use explosives while under the influence of alcohol, narcotics, or other substances that may impair judgment.
6. A Job Safety Analysis (JSA) shall be developed for each blasting operation.
7. Security surveillance and theft prevention procedures shall be maintained. TVA Police & Emergency Management (TVAP&EM) shall be notified in advance of bringing any explosive and/or blasting agents onto any TVA property.
8. A pre-blast survey is to be made of nearby property so that damage claims can be verified by a post-blast inspection when necessary.
9. All blasting storage, handling, operations and use shall comply with NFPA 495, Explosives Material Code.
10. A holder of a permit to blast shall keep a daily record of all explosive materials received and fired or otherwise disposed, This permit shall be retained for 5 years and made available to TVA Safety and TVA P&EM.

11. The loss, theft, or unlawful removal of explosive materials shall be reported within 24 hours to the US Department of Justice, Bureau of Alcohol, Tobacco, Firearms, and Explosives; TVA Safety and TVA P&EM.
12. Two receiving and dispensing logs shall be maintained at all times for explosives stored on the project. One log shall be kept in the magazine and the other shall be kept by the office of the Blasting Supervisor. These logs will be subject to unannounced inspection by TVA P&EM and TVA Corporate Safety.
13. The blasting contractor shall originate all Blast Data Sheets and forward them to the MOIC for approval.
14. The blasting contractor shall determine the method and location for removing personnel and equipment to a safe area.
15. The blasting record log shall be initiated and kept up to date.

27 Eyewash Stations and Emergency Showers

1. Emergency showers, eyewash, or other deluge systems shall be provided in areas where acid, caustic, or other hazardous chemicals are used, stored, or handled and the possibility of spillage exists.
2. Self contained portable eyewash units are recommended for use in most areas due to maintenance and cost. The minimum size is a 6-gallon, 15-minute unit. Post signs that the unit must be present prior to beginning work involving potential contact with the chemical.
3. Install and maintain emergency shower or eyewash units in accordance with ANSI Z358.1, Emergency Eyewash and Shower Standard (unless otherwise specified by this section) and OSHA regulations. The specified hazardous locations have the following distance requirements:
    a. Within 10 seconds or 55 feet for units installed after Z358.1-2009 version.
    b. Within 25 feet of battery charging/service stations
    c. In certain situations, such as exposure to highly corrosive chemicals, flushing units may be required immediately adjacent (less than 10 ft.) to the specified hazard. Consult safety professionals for guidance.
4. Keep eyewashes and emergency showers free from any obstructions and accessible from at least two directions.
5. Maintain a clear and unobstructed 45-inch radius around units at all times.
6. Locate units where the water spray will not contact electrical apparatus or power outlets.
7. Mark units with highly visible identification signs.
8. Actuating valves shall be easily accessible and manipulated.
9. Flow rates for permanent units shall be approximately 20 gallons per minute for emergency showers and 3 gallons per minute for the eyewash units.
10. Eyewash units shall provide twin curtains of aerated water that cover the face area.
11. Use deionized water for the fixed water supply in building areas where potable water is not available.
12. Water temperature of units shall be “tepid” (60 to 100 degrees F).
13. Protect self contained portable units and the supply lines of permanently installed eyewash units from freezing and excessive heat. Heat tracing is permitted.
14. Test operating valves on all permanently installed units quarterly. Maintain a record of the test.
15. Inspect, prior to commencing work, all portable units, units at battery charging/maintenance locations, and units at locations where highly hazardous chemicals are stored or used.
16. When maintenance on building water systems requires any units to be inoperative, the supervisor(s) of employees working in the affected area shall be notified prior to the outage. Immediately after service is interrupted, each eyewash/shower shall be marked “Out of Service.” An adequate number of portable units shall be located in the work area and marked until water supply is restored.

28 Fall Protection

1. Fall protection such as guardrails, positioning restraint systems or fall arrest systems is required when workers are exposed to a fall of greater than 4 feet to the lower level.
2. All workers exposed to fall hazards must be trained in fall protection techniques and the use of fall protection equipment.
3. Before beginning work, identify workplace fall hazards and determine the safest fall protection strategy - elimination or use of fall protection equipment.
4. Consider the hazards of wearing fall protection when evaluating the hazards. Examples include:
    a. Striking the lower level due to a miscalculation
    b. Bodily injury from arresting forces and suspension trauma.
    c. Swing potential
5. TVA Form 21050, Fall Protection Work and Rescue Plan, may be used as a tool for identifying hazards, identifying proper equipment and prompt rescue considerations.
6. Read all instructions and warnings before using any fall protection equipment and understand the safe work requirements pertaining to fall protection.
7. Fall prevention is always the preferred method for fall hazard mitigation. Where guardrails and barriers can be feasibly installed, they should be used.
8. A personal fall protection system shall be worn by employees under the following conditions:
    a. Whenever working from unprotected working surfaces greater than 4 feet high.
    b. Whenever working from suspended scaffolds of a non-rigid type (e.g. wire rope).
9. When choosing a fall arrest system, the system must prevent the user from striking the level below as well as limit swing radius.
10. Anchorage points must be installed at a height that meets or exceeds the fall potential distance. Fall potential distance must be calculated as follows: Add the length of the shock absorbing lanyard plus the maximum elongation of the shock absorber plus the height of the worker plus a safety factor of 3 feet (Example: 6-foot lanyard plus 3-foot absorber plus 6-foot worker plus 3-foot safety factor = 18 feet).
11. Verify fall protection is designed to withstand the weight of the worker and tools. Most manufacturers impose a 310-pound limit total for the worker and tools when using fall protection equipment.
12. Verify all components of the fall arrest system are in good condition. Inspect them before use.
13. Always ensure that the harness fits properly. When donning a harness:
    a. Slip straps over shoulders so D-ring is located in middle of back between shoulder blades.
    b. Ensure chest strap is positioned in the mid chest area,
    c. After all straps are buckled, tighten all buckles so that harness fits snug but allows full range of movement. Pass excess strap through loop keepers (if equipped).
14. Fall protection is not required when working from a portable ladder unless a fall potential exists when the ladder is positioned (e.g. adjacent to a loading well). Fall protection shall be used in cases where the ladder exceeds 20 feet, and the employee must release from three points of contact to perform work, or the ladder is used frequently with unprotected fall exposure to employees.
15. If a fall occurs, remove all components of the fall protection system from service and report the fall to supervision.
16. All personal fall arrest system equipment shall be removed from service immediately when it experiences shock, impact loading, or chemical exposure; when it is overdue for inspection or when visible damage is noted. Harnesses that cannot pass inspection or have been subject to a fall shall be disposed. It is highly recommended that they be destroyed before being disposed of.
17. Do not use rigging that has previously been in service as rigging equipment as fall protection equipment. Do not use fall protection equipment for rigging purposes.
18. For unusual applications that are not addressed in this manual, consult your supervisor and/or

assigned safety professional.

28.1 Anchorage Points

1. Anchor points and attachments must be capable of supporting 5000 lbs. per worker attached, or shall be designed, installed, and used as follows:
    a. As part of a complete personal fall arrest system which maintains a safety factor of at least two, and,
    b. Under the supervision of competent person.
2. If there is any doubt about the strength of the anchor and/or attachment point, **DO NOT ATTACH**. Search for an alternative anchor point and select a proper attachment device.
3. Crane hooks may be used as anchorage points provided the following conditions are met:
    a. The hook is equipped with a safety latch
    b. The hook is capable of supporting 5000 pounds per person as determined by a person qualified to determine crane and hook capacity.
    c. The potential for free fall is limited to 4 feet or less without potential for a swinging fall.
    d. The work has been evaluated for other suitable anchorage points and no other suitable anchorage points are available
    e. The crane cannot inadvertently start up, is locked into position and employees have been instructed not to use the crane while it is being used as an anchorage point.
    f. Personnel will not be lifted while anchored to the hook.

28.2 Boatswain's Chairs/Seats

1. Chair tackle shall consist of the correct size ball bearings or bushed blocks containing safety hooks and properly "eye spliced" first grade manila rope with a diameter of at least 5/8 inch. Other rope may be used if it satisfies the strength and durability of manila rope.
2. Boatswain chair seat slings shall:
    a. Be reeved through 4 corner holes in the seat
    b. Cross each other on the underside of the seat
    c. Be rigged so no slippage occurs that can cause the seat to become un-level.
    d. Be a minimum of 5/8 inch diameter and made of fiber, synthetic or other material that satisfies the criteria of manila rope. If heat producing activities such as gas or arc welding will be performed, the sling must be at least 3/8-inch wire rope.
    e. Non-cross laminated wood chairs shall be reinforced on the underside by cleats that are securely fastened to prevent the board from splitting.
3. Always follow the manufacturer's instructions when using boatswain chairs.
4. Always inspect all equipment before use.
5. Ensure the capacity of the equipment being used is not exceeded.
6. A boatswain chair shall always be used with a separate fall arrest system as a back up.
7. Minimize swing impact by working as close to directly below the anchorage point as possible.
8. Never use a boatswain chair to arrest a free fall.
9. Never alter or modify a boatswain chair.
10. Properly store the equipment to protect it from damage.

28.3 Control Access Zone

2. A fall protection-controlled access zone shall only be used when constructing or repairing a flat or low slope roof and where it is infeasible or creates a greater hazard to use guardrails, safety nets, or personal fall arrest systems. The controlled access zone shall be designated and clearly marked.
3. All access to the controlled access zone shall be restricted to properly briefed personnel on the hazards of working inside a controlled access zone.
4. The controlled access zone shall be defined by a control line or by other means that restrict access.

5. When control lines are used, these lines shall be:
    a. Not less than six (6) feet from the leading edge.
    b. Extend along and running approximately parallel to the entire length of the unprotected or leading edge.
    c. Connected on each side to a guardrail system or wall.
    d. Consisting of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:
        i. Flagged or otherwise clearly marked at not more than 6-foot intervals with high-visibility material.
        ii. Rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches from the walking/working surface, and its highest point is not more than 45 inches from the walking/working surface.
        iii. Have a minimum breaking strength of 200 pounds.

28.4 Safety Monitoring System

1. A fall protection safety monitoring system shall only be used when no other feasible means of fall protection/arrest is available.
2. When using a fall protection safety monitoring system, a JSA must be developed and MOIC approval is required.
3. A fall protection safety monitoring system shall only be used when it exposes only a minimum number of employees for the time necessary to actually accomplish the job. The maximum number of monitored workers by one safety monitor is six (6) if all workers are in visual control of the monitor.
4. The duties of the safety monitor are to:
    a. Warn by voice when approaching the open edge in an unsafe manner.
    b. Warn by voice if there is a dangerous situation developing which cannot be seen by another person involved with product placement (e.g., product getting out of control).
    c. Make the designated erectors aware they are in a dangerous area.
    d. Be competent in recognizing fall hazards.
    e. Warn employees when they appear to be unaware of a fall hazard or are acting in an unsafe manner.
    f. Be on the same walking/working surface as the monitored employees and within visual sighting distance of the monitored employees. If the work is being performed in a congested area, such as a flatbed truck, the safety monitor may be stationed on a different level than the walking/working surface, provided visual contact with the exposed edge and employees is maintained.
    g. Be close enough to communicate orally with the employees.
    h. Not allow other responsibilities to encumber monitoring. If the safety monitor becomes too burdened with other responsibilities, the monitor shall (1) stop the work or (2) turn over the safety monitoring function to another designated, competent person.
5. Fall protection safety monitoring systems shall not be used during very windy conditions or when weather conditions cause the walking-working surfaces to become icy or slippery.

28.5 Fall Restraint System

1. A Fall Restraint System (FRS) is defined as an approved device and any necessary components that function together to restrain an employee in such a manner as to prevent that employee from falling to a lower level.
2. FRSs shall have the capacity to withstand at least three thousand (3000) pounds of force or twice the maximum expected force that is needed to restrain the person from exposure to the fall hazard.

3. FRSs may consist of ANSI approved safety harnesses attached to a securely rigged restraint line with an anchorage point capable of supporting at least three thousand (3000) pounds of force or twice the maximum expected force that is needed to restrain the person.

28.6 Inspection and Maintenance of Fall Protection Equipment

1. Prior to each use, inspect personal fall protection equipment for wear damage and other deterioration. Remove defective components from service. It is highly recommended that fall protection equipment be destroyed before being disposed of.
2. Annually, designated person(s) who have met the minimum training requirements for fall protection shall inspect and document inspections for all protection equipment.
3. Personal fall protection equipment shall be color coded to show completion of the annual inspection.
4. Clean fall protection equipment in accordance with manufacturer's instructions.
5. Protect lanyards and lifelines from damage from sharp edges.
6. Store fall protection in a manner that will protect the equipment from damage and entanglement when not in use.

28.7 Lifelines/Self Retracting Lifelines

1. Protect lifelines against being cut or abraded.
2. When vertical lifelines are used, each employee must have a separate lifeline with a fall arrest device (e.g., rope grab) secured to each individual lifeline.
3. Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 feet or less shall be capable of sustaining, fully extended, a minimum tensile load of 3,000 pounds.
4. Self-retracting lifelines and lanyards that do not limit free fall distance to 2 feet or less, rip-stitch lanyards, and tearing and deforming lanyards shall be capable of sustaining, fully extended, a minimum tensile load of 5,000 pounds.
5. Horizontal lifelines shall be designed, installed, and used under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least 2.
6. Horizontal lifeline and anchorage strength must be increased for each additional employee tied-off to a single line to maintain a safety factor of at least 2.
7. Vertical lifelines and lanyards must have a minimum breaking strength of 5,000 pounds.
8. Portable, self-contained lifelines are attached to an anchorage point above the work area with lifeline connected to full body harness. The lifeline must freely retract when the worker moves closer to the anchorage and extends as the worker moves away from it.

28.8 Personal Fall Arrest Systems

1. A Personal Fall Arrest System (PFAS) consists of an anchorage, connectors, and a body harness and may include a deceleration device, lifeline, or suitable combinations. A PFAS is designed to be passive (i.e. only come into service when a fall occurs).
2. A PFAS must do the following:
    a. Limit maximum arresting force to 1,800 pounds when used with a body harness.
    b. Be rigged so that an employee can neither free fall more than 6 feet nor contact any lower level.
    c. Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet; and
    d. Have sufficient strength to withstand twice the potential impact energy of free falling a distance of 6 feet or the free fall distance permitted by the system, whichever is less.
3. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body harnesses shall be made of synthetic fibers.
4. Anchorages shall be designed, installed, and used under the supervision of a competent person.

28.9 Personal Positioning System

1. A personal positioning system holds a worker in place while allowing a hands-free work environment. Whenever a worker leans back, the system becomes active. These devices are typically used with an approved ladder climbing device.
2. A PFAS shall be used in conjunction with the personal positioning system since the positioning system is not specifically designed for fall arrest purposes.
3. The components of a positioning system typically include a full body harness, a rebar chain assembly and vertical rods.

28.10 Personal Travel Restraint System

1. Personal Travel Restraint Systems are to be used to eliminate the potential for an individual to fall from an edge or open hole and shall not be subjected to shock load.
2. If the restraint system will not absolutely ensure the person will not reach the edge, then a personal fall arrest system must be used.
3. Ensure the anchorage point is capable of sustaining 200 pounds and will prevent the user from reaching the edge.

28.11 Positioning Device System

1. Use positioning device systems with a body harness to support a worker on an elevated surface to free the hands to work or climb.
2. When using a positioning device, it must:
    a. Be part of a fall arrest system
    b. Limit free fall to less than two feet
    c. Not require the employee to hold, push, or pull any part of the system.
    d. Be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds, whichever is greater.

28.12 Proper Connection to Anchors

1. When using a full-body harness, connecting devices shall be attached to the D-ring in the middle of the back.
2. When using a body harness for restraint, connecting devices shall be to the D-ring in the back at waist level.
3. Side D-rings or front D-rings are for positioning only--not fall arrest.
4. Do not connect a lanyard between a body harness and a self-retracting deceleration device or connect two lanyards together in succession.
5. Always keep free-fall distance to 6 feet or less. If using a six-foot or shorter lanyard, attach at or above your back D-ring. In addition, attach to an anchor point that ensures the lower level cannot be struck during a fall. This is especially important when utilizing shock absorbers.

28.13 Safety Net Systems

1. Install safety nets as close as practicable under the walking/working surface on which employees are working and never more than 30 feet below such surfaces.
2. Safety nets shall be installed with sufficient clearance underneath to prevent contact with the surface or structure below.
3. Inspect safety nets at least once a week for wear, damage, and other deterioration. Remove defective nets from service.
4. The maximum size of each safety net mesh opening shall not exceed 36 square inches nor be longer than 6 inches on any side, and the openings, measured center-to-center, of mesh ropes or webbing, shall not exceed 6 inches. All mesh crossings shall be secured to prevent enlargement of the mesh opening.

5. Each safety net or section shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds. Connections between safety net panels shall be as strong as integral net components and be spaced no more than 6 inches apart.

28.14 Suspension Systems

1. Personal suspension systems are designed to lower and support a worker while allowing a hands-free work environment. Tasks appropriate for positioning systems include window washing and painting.
2. Always use a back-up fall arrest system in conjunction with a personal suspension system.

28.15 Tie-Off Requirements

1. Tie-off is the act of connecting, directly or indirectly, to an anchorage point.
2. To reduce free fall distance, tie-off the attachment device above the D-Ring at the back of the full body harness.
3. Only webbing and snap hooks designed to tie back to themselves can be used for that application (i.e. Miller Back Biter SRL).
4. When anchorage points (i.e. I and H beams) present sharp edges, a softener must be used to prevent damage to the fall protection equipment.

28.16 Snap Hooks

1. Unless the snap hook is a locking type and designed for the following connections, they shall not be engaged:
    a. Directly to webbing, rope, or wire rope.
    b. To each other.
    c. To a D-ring to which another snap hook or other connector is attached, or
    d. To a horizontal lifeline
2. Do not connect snap hooks to any object incompatible in shape or dimension that may cause the connected object to depress the snap hook keeper and release the snap hook.
3. Never attach two snap hooks together.
4. On suspended scaffolds or similar work platforms with horizontal lifelines that may become vertical lifelines, connect to the connect to a horizontal lifeline with devices capable of locking in both directions on the lifeline.
5. Connect lanyards to the anchorage point with snap hooks in a way that does not reduce its required strength. The snap hooks and D-rings on the body harness must fit together properly.
6. When using spring-loaded locking snap hook, ensure there is a spring-loaded keeper that is in working order.
7. Make sure snap hooks are compatible with the hardware where they are being attached.

28.17 Walking/Working Surfaces

28.18 Working Above Water or Liquids

1. When working at heights above or adjacent to liquids where the risk of drowning exists and barriers do not exist (i.e. guardrails), fall protection is required.
2. Wear an approved life jacket where fall protection cannot be used and there is a hazard of falling into water or other non-hazardous liquid.
3. Wear an approved Personal Flotation Device coat or suit when:
    a. The risk of hypothermia is considered greater than the hazard of drowning
    b. A life jacket is not specified in the written procedures.
4. When working above or adjacent to water or other liquids, do not work alone.
5. When planning for fall protection rescue when working over water, consider the specific flotation devices necessary, the potential for hypothermia, Consider the following in rescue planning for

working over water, risks in the water such as current or rocks, and the type of availability of the equipment needed for rescue, including communication to rescue services.

28.19 Working from Low Slope or Flat Roofs

1. When working less than 6 feet from a roof edge, one of the following methods must be in place to ensure you are protected from a fall.
    a. Guardrail system, or.
    b. Safety net system. or.
    c. Travel restraint system, or.
    d. Personal fall arrest system
2. When working more than 6 feet but less than 15 feet from a roof edge, one of the following methods must be in place to ensure you are protected from a fall: protect from a roof edge by one of the following methods:
    a. Guardrail system, or.
    b. Safety net system, or.
    c. Travel restraint system, or.
    d. Personal fall arrest system, or.
    e. Perform work and remain in a designated area that is not less than 6 feet from the edge and the work is infrequent and temporary. Examples of infrequent and temporary are work activities that take less time to perform than set up of fall protection (annual maintenance, monthly battery or filter replacements, etc.)
3. When working more than 15 feet from a roof edge, no fall protection is necessary if the work is infrequent and temporary, or you are prohibited from going or working within 15 feet of the roof's edge. When the work is not infrequent and temporary or you will be within 15 foot of the roof's edge, #1 or #2 above shall apply.

29 Fire Extinguishers

1. Locate extinguishers where they will not be blocked or hidden.
2. Installation height is based upon gross extinguisher weight:
    a. Gross weight ≤40-lb shall be installed so that the top of the fire extinguisher is not >60-in above the floor.
    b. Gross weight >40-lb (except wheeled types) shall be installed so that the top of the fire extinguisher is not >42-in. above the floor.
3. When installing fire extinguishers, ensure the clearance between the bottom of the hand portable fire extinguisher and the floor is not less than 4-in.
4. Do not permanently place portable extinguishers directly upon the floor.
5. Identify the location of extinguishers. Where signs are used to indicate the location, the signs shall be located in close proximity to the extinguisher and visible from the normal path of travel.
6. Extinguishers for ordinary combustibles (Class A) protection shall be located close to the hazard to be protected, ≤75-ft travel distance.
7. Extinguishers for fires other than ordinary combustibles (Class B, C, D & K) shall be located close to the hazard to be protected, ≤50-ft travel distance.
8. Extinguishers shall not be placed within flammable liquid storage rooms, unless the maximum travel distance to exit the room ≤50-ft. Install portable extinguishers immediately outside of the self-closing door to the flammable liquids storage room.
9. Water-based extinguishers must be protected from freezing.
10. When using a portable fire extinguisher, use the appropriate type for the fire.

29.1 Inspection, Testing and Maintenance of Extinguishers

1. Inspections, tests, and maintenance, including recharging of extinguishers shall be performed in accordance with the manufacturer's instructions.
2. Inspect fire extinguishers either manually or by means of an electronic monitoring device/system at a minimum of 30-day intervals. Fire extinguishers shall be inspected at more frequent intervals (e.g., daily or weekly) when circumstances require. Examples include:
    a. During outages.
    b. Where high frequency of fires in the past have occurred.
    c. Locations that make fire extinguishers susceptible to physical damage.
    d. Exposure to abnormal temperatures or corrosive atmospheres.
3. Monthly inspection of fire extinguishers shall include a check of at least the following items:
    a. Location in designated place
    b. No obstruction to access or visibility
    c. Pressure gauge reading or indicator in the operable range or position
    d. Fullness determined by weighing or hefting for self expelling-type extinguishers, cartridge-operated extinguishers, and pump tanks
    e. Condition of tires, wheels, carriage, hose, and nozzle for wheeled extinguishers
    f. Verifying that operating instructions on nameplates are legible and face outward
    g. Checking for broken or missing safety/tamper seals.
    h. Examination for obvious physical damage, corrosion, leakage, or clogged nozzle
4. Fire extinguisher inspection records shall be kept by the site or facility where the extinguishers are located. At a minimum, the inspection record shall include the date the manual inspection was performed and the initials of the person performing the inspection.
5. The inspection record for manual inspections shall be kept on a tag or label attached to the fire extinguisher, on an inspection checklist maintained on file, or by an electronic method and shall be kept to include the previous 12 monthly inspections.
6. An annual external visual examination of fire extinguishers shall be made to detect obvious physical damage, corrosion, or nozzle blockage to verify that the operating instructions are present, legible, and facing forward, and to determine if a 6-year interval examination or hydrostatic test is due.
7. At the time of the maintenance, the tamper seal shall be removed by operating the pull pin or locking device.
8. Install a new listed tamper seal after maintenance.
9. All removable extinguisher boots, foot rings, and attachments shall be removed to accommodate thorough annual cylinder examinations.
10. When subjected to temperatures at or above their listed rating, stored-pressure fire extinguishers that require a 12-year hydrostatic test shall be emptied and subjected to the applicable maintenance and recharge procedures on an annual basis.
11. Fire extinguishers shall be subjected to maintenance at intervals of:
    a. Not more than 1-year,
    b. At the time of hydrostatic test, or
    c. When specifically indicated by an inspection.
12. A conductivity test shall be conducted annually on all carbon dioxide hose assemblies.
    d. Carbon dioxide hose assemblies that fail the conductivity test shall be replaced.
    e. Carbon dioxide hose assemblies that pass a conductivity test shall have the test information recorded on a durable weatherproof label. The label shall be affixed to the hose by means of a heatless process. The label shall include the month and year the test was performed as well as the name or initials of qualified person performing the test.
13. Discharge hoses on wheeled-type fire extinguishers shall be completely uncoiled and examined for damage annually.
14. Discharge hoses on wheeled extinguishers shall be recoiled in a manner to prevent kinks and to allow rapid deployment in accordance with the manufacturer's instructions.

15. Pressure regulators provided with wheeled-type fire extinguishers shall be tested annually for outlet static pressure and flow rate in accordance with the manufacturer's instructions.
16. Damaged extinguishers shall be immediately removed from service and hydrostatically tested or replaced. Leaking, corroded, or otherwise damaged extinguishers shall be discarded or returned to the manufacturer for repair.
17. Fire extinguishers shall be internally examined at intervals that meet the manufacturer requirements or NFPA 10 guidelines, whichever is more stringent.
18. Hydrostatic tests shall:
    a. Be made on all portable fire extinguishers at periodic intervals, in accordance with manufacturer requirements or NFPA 10 guidelines, whichever is more stringent.
    b. Include the hose.
    c. Be conducted by a qualified individual.

30 Flammable and Combustible Liquids

1. This section does not apply to spraying flammable/combustible liquids or dipping or coating using flammable/combustible liquids.
2. Follow TVA-TSP-18.917**,** Hazard Communication regarding identification and marking of drums, cans, tanks, bottles, safety cans, and shipping containers.
3. The amount of flammable/combustible liquid outside of dedicated flammable liquids storage rooms or listed cabinets shall be:
    a. Limited to the amount required for the task being performed.
    b. Not exceed the maximum quantity expected to be used in one (1) shift.
4. Additional storage information is found in the tables at the end of this section.
5. Incorporate the substitution of a higher flashpoint liquid for a low flashpoint liquid as part of the pre-work planning, when feasible.
6. Reference the Safety Data Sheet to ensure safe work and storage requirements for the flammable/ combustible liquids are met.
7. Do not smoke or use open flames or other potential ignition sources within 50-ft of flammable/combustible liquid storage, use and transfer areas. Ensure the area is properly posted as a visual reminder.
8. Use non-sparking tools where the potential for flammable vapors may exist or develop.
9. Keep combustible waste material and residues in operating areas to a minimum. Store in listed/approved covered metal containers and dispose of daily.
10. Keep ground areas around facilities where liquids are stored, handled, or used free of weeds, trash, or other unnecessary combustible materials.
11. Keep aisles, exit paths and exits clear of obstructions to allow orderly evacuation and clear access for manual firefighting.
12. Do not use flammable/combustible liquids in confined spaces, unless all of the following has been met:
    a. A confined space entry permit has been obtained.
    b. A hot work permit has been obtained (if hot work is going to occur).
    c. Continuous monitoring of the following gases is occurring (i.e., combustible vapors and oxygen).
    d. Continuous, mechanically powered fresh air ventilation of the confined space is occurring.
13. When storing small storage containers (≤5 gal) of flammable/combustible liquids:
    a. Use listed Class 1 safety cans (with flame arrestors) for handling small quantities of Class I, II, and IIIA liquids. Class I Safety cans are not the red, plastic "gasoline" containers.
    b. Liquids supplied in manufacturer's original containers that are ≤5-gallons may continue to be stored and used from the originally supplied container.

14. Provide containment that will hold at least the single largest container for all containers outside of dedicated storage areas with a capacity ≥55-gallons. This includes dedicated liquid storage rooms and storage in fixed tanks.
15. Transport flammable/combustible liquids using material handling devices intended for the type of container. Examples include hand trucks, dollies or other specialized equipment (e.g., drum haulers, drum grips). Lifting or moving drum(s) using only the forks of a lift truck is NOT allowed.
16. When using Class II and Class III liquids heated at or above their flash point, follow the requirements for Class I liquids.
17. Install automatic water spray or fire sprinklers under all obstructions containing flammable/combustible liquids (e.g., mixing vessels, storage, lube oil and bearing oil tanks) when the obstruction is >4-ft in width or ≥10-ft^2 in area.
18. Do not stack flammable/combustible liquids in containers ≥30-gallons.
19. Relocate leaking containers to a flammable/combustible liquids storage room or take them to a safe location outside of the building. Transfer the contents to an undamaged container.
20. Do not place flammable/combustible liquid containers closer than 3-ft to the nearest beam, chord, girder, roof member or other obstruction, and keep the containers at least 3-ft below sprinkler deflectors or discharge orifices of water spray, or other fire protection systems.
21. Replace the cover cap or bung immediately after dispensing or when the container is empty.
22. Wear proper PPE when working with any flammable/combustible liquid.
23. All fire protection equipment shall be properly maintained, and periodic inspections and tests shall be done in accordance with both standard practice and the equipment manufacturer's recommendations.
24. Maintenance and operating practices shall be established and implemented to control leakage and prevent spillage of flammable/combustible liquids.

30.1 Dispensing Requirements

1. Drum pumps, self-closing faucets, and drip cans shall be listed/approved.
2. For upright dispensing from drums:
    a. Use listed/approved hand operated or low volume pneumatic drum pumps.
    b. Pressurizing a drum, portable tank, or any other container by any means to transfer flammable/combustible liquids is not permitted. Air pressure shall not be used to pressurize any container containing flammable/combustible.
3. For on-side dispensing from drums:
    a. Provide self-closing faucets when dispensing Class I, II and IIIA liquids.
    b. Use listed drip cans below faucets for Class I and II liquids.
    c. A shallow metal drip pan is acceptable for use with Class III combustible liquids.
4. When dispensing or transferring flammable/combustible liquids:
    a. Ground and/or bond together conductive containers (tank cars, trailers tanks, portable containers, etc.) to reduce the fire and explosion potential from static electricity when transferring liquids between containers. When dispensing from drums, if the transfer
    b. Hose is conductive and good electrical contact is established and maintained; separate bonding is not required.
    c. Provide safety bungs (on)
    d. Drums of Class I and II liquids arranged for upright dispensing with a drum pump that is not equipped with pressure and vacuum relief vents.
    e. Drums of all classes of liquids arranged for on-side dispensing.
    f. For drum storage of flammable/combustible liquids located in a dispensing area if the drums could be exposed to a spill from the dispensing drum, and no fixed suppression system protection exists.
    g. Only to the 2-inch drum opening.

30.2 Storage & Staging Requirements

1. Store flammable/combustible liquids using one of the following:
    a. Flammable liquids storage cabinet (listed/approved)
    b. Flammable liquids storage room
    c. Hazardous materials storage locker (listed/approved)
    d. Liquids Warehouse
    e. Separated and detached building
    f. Open/outdoor storage
2. If questions arise about storage requirements, contact your BU fire protection or reference the applicable NFPA standard. BU fire protection and TVA Safety have access to current NFPA standards.
3. Contact TVA Environmental for specifics about containment, drainage and spill control.
4. Do not stage or store flammable/combustible liquids in or adjacent to (within 50-ft of) exits, stairways, elevators, or areas normally used for the passage of people to an exit.
5. Do not use office, general-purpose storage areas, process/production/generating, and other critical areas as storage areas for flammable/ combustible liquids.
6. Separate flammable/combustible liquids from incompatible materials by a minimum distance of 25-ft.
7. Do not store materials that are water-reactive in the same area (or room) with flammable or combustible liquids.
8. When flammable/combustible liquids are stored/staged inside a building and outside of dedicated storage areas and cabinets, limitations apply as outlined below. These limitations for flammable/combustible liquids do not apply to liquids within equipment such as bearing seal reservoirs.
    a. No staging or storage is permitted in areas where there are no sprinklers.
    b. Where sprinklers do exist, staging is limited based on the class of liquid, type of container, floor (elevation) of the structure and control areas/fire areas.
9. The temporary staging of flammable/combustible liquids in containers, drums, intermediate bulk containers (IBC), and portable tanks shall be limited to the following conditions:
    a. Only the amount of liquid needed for not greater than one continuous 24-hour period is permitted within the production/process/generating area.
    b. Long-term storage (greater than 24-hours) is not permissible outside of the approved methods listed in this section, except when meeting all of the following:
        i. Mixed liquids containers can remain in the process area provided they do not increase the hazard. For example, containers used to collect oil contaminated "condensate" are considered as water, when the:
        ii. Volume of the mixture is ≥90% water.
        iii. Mixture is periodically tested to verify the concentration.
        iv. Container is labeled in accordance with TVA-TSP-18.917 Hazard Communications.
        v. Containers, IBCs, and portable tanks that are in use, and needed to supply the process for not greater than one continuous 24-hour period.
10. Lube oil drums (Class IIIB liquids) may be stored near equipment needing periodic lubrication; however, these drums shall be placed within a flammable liquid storage cabinet designed for drums and the lube oil shall then be dispensed from the drum located within this cabinet.
11. Containers that were filled in the production/generating area may remain there for the balance of the shift but shall be relocated to an appropriate storage area before the end of the workday (or shift in the case of 24-hour-a-day operation).

12. Class IIIB liquids (FP ≥200°F) specific requirements are as follows:
    a. When used for building or equipment maintenance, painting, or similar infrequent maintenance purposes (including lube oil racks) shall be permitted to be stored in closed containers outside of listed storage cabinets (and dedicated storage rooms) if total quantity is limited to an amount not exceeding both of the following:
        i. a 5-day supply and
        ii. As specified in the siting requirements below.
13. Siting (location) requirements below for Class IIIB liquids acknowledge that situations exist where infrequent building maintenance activities such as cleaning, painting, changing lube and cooling oils, may require the use of flammable/combustible liquids and that such material would be present in the facility during the duration of such activities.
    a. At the completion of the maintenance/outage activity, all materials must be removed from the building or stored in an approved method.
    b. Class IIIB liquids shall:
        i. Be in metal containers not exceeding 55-gallon per container and limited to those containers in which the liquid was supplied.
        ii. Have containment.
        iii. Be in sprinklered areas.
    c. Class IIIB liquids shall not be:
        i. Adjacent to or under turbine pedestals, cable trays, cooling or hydraulic oil reservoirs.
        ii. In or adjacent to exits, areas used as egress ways, stairways, and elevators.
        iii. Adjacent to firefighting equipment including standpipe hose stations.
14. Composite Intermediate Bulk Containers (IBCs) with flexible inner receptacle, flexible IBCs, and "Bag-in-Box" IBCs are not permitted.
15. Glass containers are acceptable, subject to the limitations in the storage tables in this section
16. Flammable storage cabinets shall not be used for storage of items other than flammable or combustible liquids, or flammable spray aerosols.
17. The number of flammable cabinets allowable per control area are as follows:
    a. Non-sprinklered areas - three (3) per fire area.
    b. Sprinklered areas - Unlimited number of cabinets
18. The volume of Class I, Class II, and Class IIIA liquids stored in an individual storage cabinet shall not exceed 120-gallons. The total aggregate volume of Class I, Class II, and Class IIIA liquids in a group of storage cabinets shall not exceed the maximum allowable quantity of flammable/combustible liquids per control area based on the occupancy where the cabinets are located.
19. Flammable liquid cabinets and the staging of unprotected flammable/ combustible liquids are not permitted to be:
    a. Under or adjacent to cable trays, and adjacent turbine pedestals.
    b. Adjacent to oil reservoirs.
    c. Adjacent to firefighting equipment.
20. Storage cabinets are not to be ventilated. All factory supplied bung openings shall be sealed with original type equipment.
21. Storage cabinets do not need to be grounded or bonded.
22. Flammable Liquids Storage Rooms shall:
    a. Be protected by fixed, approved automatic fire suppression (other than carbon dioxide)
    b. Maintain a 4-ft wide clear aisle inside leading to the room exit.
23. Combustible and flammable liquids shall be stored in closed containers at all times except during dispensing or actual use.

24. General purpose warehouses that store flammable and/or combustible liquids shall be protected by fixed automatic sprinkler protection. Quantity limitations and types of containers are specified in NFPA 30. Contact your BU Fire Protection for guidance, as the minimum protection criteria for general-purpose warehouses varies in accordance with the class of liquid being stored.
25. Flammable Liquids Storage Warehouses shall meet all criteria as found in NFPA 30, including approved automatic fire suppression systems.
26. Flammable Liquids/Hazardous Materials Storage Lockers requirements are as follows:
    a. The lockers must be (both) 2-hour and 4-hour fire resistive rated.
    b. Vertical stacking of lockers shall not be permitted.
    c. Where electrical wiring and equipment exist within the locker, it is to be the same as for a flammable liquids storage room.
    d. Lockers shall include a spill containment system to prevent the flow of liquids from the structure under emergency conditions. This containment system shall have sufficient capacity to contain 10% of the volume of containers allowed in the locker or the volume of the largest container, whichever is greater.
    e. Warning signs for storage lockers shall be the same as for flammable liquid cabinets.
    f. For exteriorly located storage lockers, these shall be placed at distances from important buildings on site as indicated:
        i. >10 to 100-feet for 2-hour fire rated lockers.
        ii. ≤10 feet for 4-hour fire rated lockers.
    g. Interiorly located (within important buildings) storage lockers, siting requirements are as follows (depending upon whether the locker is 2-hour or 4-hour rated):
        i. 2-hour fire rated lockers (limited to ≤500-ft^2 in area) are considered the same as flammable liquids storage rooms, relative to all protection requirements.
        ii. 2-hour fire rated lockers must be located within a sprinklered area.
        iii. 4-hour fire rated lockers (>500 to 1500-ft^2) are permitted in non-sprinklered areas.
    h. Lockers within buildings shall have a pre-engineered dry chemical system installed within the locker, or other automatic fixed fire suppression approved by your Business Unit.
27. Separated/Detached Unprotected Buildings, which include "Conex" type shipping Containers and/or Open Outdoor Storage shall:
    a. Be ≥200-ft from any important building, unless protection for exposures is provided, in which 100-ft is acceptable.
    b. Have diking (or containment) to contain the spill of the largest container and to account for maximum amount of residual rainwater.
    c. Have warning signs attached

30.3 Direct and Indirect Measurement Instruments

1. Equipment containing flammable/combustible liquids should primarily use indirect measurement (e.g., thermocouple to measure temperature, sensor to measure pressure of liquid level, etc.) to reduce or eliminate leakage in the event of instrument failure.
2. When direct measurement instruments are used, the following safeguards shall be applied:
    a. Direct measurement instruments that use glass for containment (e.g., sight glasses, liquid level indicator-glass type, rotameter) shall be used as a last resort and avoided entirely on processes that contain flammable gases or flammable/combustible liquids above their normal atmospheric boiling point.
    b. Sight glasses shall be mechanically guarded against physical damage.
    c. Follow the manufacturer's recommendations for mounting and maintenance.
    d. The instruments' materials shall be compatible with the materials being handled.
    e. Glass shall be rated for the temperature, pressure, and chemical service conditions under which it will operate.
    f. The instrument’s pressure rating shall be equal to or greater than the equipment to which they are attached.

g. Use restricted orifices in piping connecting the instruments to the equipment.
h. Avoid sudden temperature changes (e.g., addition of a very high/ low temperature liquid to the inside/outside of a vessel) on instruments with glass components.
i. Inspect all level control instruments and glass sight glasses on a regular schedule. Determine inspection frequency by the severity of local conditions, and the approval of your BU Fire Protection Program Manager/Engineer.
j. When surface damage is detected, replace the sight glass immediately. If sight glass is exposed to frequent changes in temperature/pressure, replace at regular intervals as determined by processing conditions.
k. Rotameters shall be armored/guarded and arranged so only a sample of the flow is directed through the glass-reading chamber instead of the entire stream.
l. Vents on air releases when used in conjunction with metering devices shall be piped to safe outdoor locations to prevent the release of flammable or combustible liquids in the event of meter failure.
m. Conduct instrument maintenance, including tightening bolts and replacement, only when the associated equipment or piping has been shut down and depressurized. Equipment containing flammable liquids or gases shall be emptied and purged.

30.4 Ventilation for Storage and Dispensing Areas:

1. Ventilation is required only for liquid storage areas where dispensing is occurring. See **NFPA 30** for further details.
2. Ventilation velocities shall be evaluated annually by the use of a velometer. A tag or label shall be displayed indicating the date of the last evaluation.
3. Ventilation is not required for flammable/combustible liquids cabinets.

31 Forklifts

1. Only trained employees shall be permitted to operate forklifts. Training is maintained by TVA Technical Training in accordance with OSHA regulatory requirements. Refresher training and a performance evaluation is required when:
    a. The operator has been observed operating the forklift in an unsafe manner.
    b. The operator has been involved in an accident or near-miss event.
    c. The operator has received an evaluation that indicates the operator is not operating the truck safely.
    d. The operator is assigned to drive a different type of forklift.
    e. Conditions in the workplace change in a manner that could affect the safe operation of the forklift.

2. All forklifts used on TVA plants/facilities shall meet the design and construction requirements of NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations, and ANSI B56.1, Safety Standard for Low Lift and High Lift Trucks.
3. Forklifts shall not be used if the "truck data and capacity plate" is missing or illegible.
4. Forklifts shall be selected for use based on NFPA 505 designations.
    a. Gasoline powered (G), (GS)
    b. Diesel powered (D), (DS), (DY)
    c. Liquefied petroleum gas powered (LP), (LPS)
    d. Electric powered (E), (ES), (EE), (EX)
5. Only forklifts containing the EX designation shall be used in coal handling areas.
6. In areas where volatile flammable liquids, flammable gases, combustible dust may be present, only forklifts containing the DY, EE, or EX designations shall be used.
7. Where concentrations of carbon monoxide are likely to exceed permissible exposure levels, only electric powered forklifts with E, ES, EE, or EX shall be used.
8. Forklifts must be fitted with an overhead guard. Guards may be removed in areas with low overhead clearance, but when the guard is removed, overhead lifts are prohibited.
9. Where lighting is less than two-foot candles, forklifts will be equipped with lights.
10. Forklifts must have warning lights in areas where noise would interfere with horn.
11. Modifications/additions which affect capacity and safe operation shall not be made without the manufacturer's written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. This does not apply to the use of attachments. See Section 31.1 of this manual for guidance on attachments.
12. Removable attachments (other than fork extensions) shall have a nameplate with the information indicating that "the forklift/attachment combination may be less than the capacity shown on the attachment - consult truck nameplate."
13. Do not use cell phones during the operation of forklifts. This includes talking, texting or use of any applications which may be on the phone.
14. When operating forklifts in congested areas, extra caution shall be exercised. Identify specific hazards prior to work and use mitigation measures such as barricades, vested flaggers, etc. to prevent injury to personnel or damage to equipment and structures.
15. Ensure maintenance, battery charging/changing, and inspections are performed by authorized employees.
16. Perform preventive maintenance/inspections on a regularly scheduled basis in accordance with manufacturer's instructions and keep records kept for each forklift.
17. Do not make repairs in work areas classified as Hazardous Class I, II or III.
18. Inspect forks at least annually using the criteria outlined in this section. Remove damaged forks from service immediately.
19. Keep forklifts clean of excess coal dust, oil, or grease and clean only with non-combustible cleaning agents.
20. Refuel forklifts in designated areas with the engine shut off.
21. The operator is responsible for the safety of the lift and has the authority to stop work if necessary to correct safety issues prior to continuing a lift.
22. Never use the forklift in excess of its lifting capacity.
23. Check the forklift before placing it in service. If a defect is found or develops during operation, report the condition(s) immediately to supervision.
24. Never drive or transport loads with a forklift while the forks are higher than necessary to clear the road surface.
25. Observe regular traffic rules such as keep to the right; do not tailgate; keep the truck under control; avoid sharp turns, and sound horn at all intersections on when pulling/backing in a walkway.

26. Persons other than the operator are not permitted to ride on forklift.
27. Do not operate forklift near the edge of unprotected loading docks, ramps, and platforms.
28. Keep all extremities (head, arms, feet, legs) inside the cab area of the forklift.
29. Seat belts must be present and used.
30. Do not allow anyone under or close enough to the forks or load of a forklift that would allow them to be struck if the load fell.
31. Pedestrians have the right of way.
32. Bridge plates are to be properly placed and secured if traveling onto trucks or rail cars from a loading dock or platform. Ensure that the truck or car wheels are chocked.
33. Always back down a ramp or incline with a load.
34. Always tilt the load against the back rest before moving the forklift.
35. Do not handle double-tiered loads unless they are secured together.
36. When making overhead lifts, use a forklift that has a manufacturer designed overhead guard installed.
37. When a forklift is left unattended:
    a. Fully lower forks.
    b. Place controls in neutral.
    c. Shut power off.
    d. Set brakes.
    e. Block the wheels if the forklift is parked on an incline.
38. When a propane powered forklift is left unattended, the propane tank valve shall be shut off.
39. Do not operate a forklift on any grating unless the area is known to be structurally adequate to support the forklift and load.
40. Do not use forklifts in areas where hydrogen may be leaking until the source of the leak has been found, corrected, and the area confirmed free of residual hydrogen gas.
41. Sites shall determine where forklifts are permitted to operate. Maximum floor loading limits shall be observed at all times.
42. Sites shall establish appropriate battery charging, refueling, and loading dock facilities.
43. Operational inspections shall be performed on forklifts at least daily. When the trucks are used on an “around-the-clock” basis, they shall be inspected after each shift, even when a pre-operational inspection has occurred. These inspections shall be documented on using either TVA Form 11583, Operators Daily Report Engine-Powered Lift Trucks, or TVA Form 11583A, Operator’s Daily Report Battery-Powered Lift Trucks. Business Units may use forms or cards that are equivalent provided the content meets the minimum inspection requirements listed in the aforementioned forms.
44. If the forklift is found to be in need of repair or unsafe in any way, report the matter to maintenance and do not operate the forklift until repaired. Place a defective equipment tag on the ignition until repaired.
45. The operator’s daily inspection report shall be given to the responsible foreman or supervisor and maintained on file for thirty (30) days.

31.1 Attachments

1. Use only attachments that are manufactured and designed for the forklift being used.
2. Follow all manufacturer instructions when using attachments, including the instructions for the forklift being used.
3. If there is any uncertainty related to whether the attachment can be used with the forklift, consult the forklift manufacturer.
4. Evaluate all capacity considerations before using attachments. Remember that use of attachments has the potential to affect capacity AND safe operation.
5. Removable attachments (other than fork extensions) shall have a nameplate with the information indicating that the forklift/attachment combination may be less than the capacity shown on the attachment - consult truck nameplate.

6. Using a forklift for a below-the-tine lift can only be performed using attachments designed for that purpose. “Free rigging” is prohibited, i.e., the direct placement of rigging equipment (slings, shackles, rings, etc.) onto the tines of a forklift for a below-the-tines lift.
7. If manufacturer approval is necessary for the use of an attachment and cannot be obtained, the application may be evaluated by a qualified professional engineer for approval.
8. If rigging is necessary while attachments are being used, the rigging must be performed by a qualified rigger.

31.2 Battery Charging

1. Battery charging/changing shall be conducted only in designated, clearly marked areas with an adequate, operational eyewash, emergency shower, and fire extinguishers readily available.
2. A conveyor, overhead hoist, or equivalent material handling equipment shall be provided for handling batteries.
3. Eye wash/emergency shower facilities shall be provided within 25 feet.
4. Only trained, authorized personnel shall perform battery changing and charging operations.
5. Properly position the forklift and apply the brake before attempting to change or charge batteries.
6. Ensure that the forklift is properly secured to prevent tipping due to overbalancing. Properly position and secure reinstalled batteries in the forklift.
7. A carboy tilter or siphon shall be used for handling electrolyte and protective chemical goggles or face shield, rubber gloves, or aprons shall be worn.
8. Always pour acid into water, never the reverse.
9. When charging batteries, ensure the vent caps are kept in place to avoid electrolyte spray. Exercise care to ensure that vent caps are functioning. Open the battery (or compartment) cover to dissipate heat.
10. NO SMOKING signs shall be posted in the charging area and precautions shall be taken to prevent open flames, sparks, or electric arcs in battery charging areas.
11. Keep tools and other metallic objects away from the top of uncovered batteries.

31.3 Lifting Personnel

1. Forklifts may only be used to lift personnel if the following requirements are met:
    a. The work platform is designed by a qualified manufacturer, secured to the forklift and meet construction design requirements outlined in ANSI B56.1, which includes:
        i. A slip-resistant floor surface.
        ii. A minimum of 18-in by 18-in for each platform occupant.
        iii. Protection for personnel in their normal working position on the platform from moving parts of the truck that present a hazard.
        iv. A guardrail not less than 36-in. or more than 42-in around its upper periphery and include a mid-rail (access opening shall use a hinged section or chain). The guardrail and access opening guards shall be capable of withstanding a concentrated horizontal force of 200-lbs applied at the point of least resistance without permanent deformation.
        v. A 4-inch minimum height toe plate.
    b. The floor of the platform shall not be located more than 8-in. above the upper face of the supporting truck fork blade.
    c. Means shall be provided to securely attach the platform to the lifting carriage or forks and to prevent the lifting carriage or forks from pivoting upward.
    d. The combined weight of the platform, load, and personnel shall not exceed one-half of the capacity as indicated on the nameplate of the forklift on which the platform is used.
    e. The following information shall be prominently displayed on the platform:
        i. Maximum load (including personnel and equipment).
        ii. Weight of empty platform, and the minimum capacity of the forklift on which the platform can be used.

2. Prior to beginning personnel lifting operations:
    a. The platform shall be securely attached to the lifting carriage or forks.
    b. The lifting mechanism shall be operated through its entire lift height to ensure smooth operation.
    c. The mast shall be vertical and not operating on a side slope.
    d. The platform shall be horizontal and centered and not tilted forward or rearward.
    e. The forklift shall be on firm and level footing.
    f. The parking brake shall be applied and only released for minor maneuvering as requested by the elevated personnel.
    g. The area shall be marked with barrier tape to warn of work by elevated personnel.
3. During personnel lifting operations:
    a. The forklift operator shall lift and lower personnel with caution and only at their request (a signal person shall be used where the operator's vision is obstructed).
    b. Overhead obstructions and electrical wires shall be avoided.
    c. The forklift operator shall keep hands and feet clear of controls other than those in use.
    d. Personnel are to remain on the platform floor.
    e. Personnel shall not attempt to enter or exit the platform until it has been lowered to the floor or attempt to enter or exit the platform by climbing on any part of the forklift.
    f. Employees shall maintain 100% fall protection at all times while in the platform.
    g. The operator shall remain seated at the controls at all times while employees are in the platform.

31.4 Loading Dock Operations

1. Before loading/unloading highway trucks or trailers, brakes on the trucks/trailers shall be applied and wheel chocks or other positive mechanical means used to prevent unintentional movement of the trucks/trailers.
2. Whenever forklifts are driven onto semi-trailers not coupled to a tractor, supports shall be provided to prevent upending or corner dipping.
3. Dock boards/bridge plates shall be designed and maintained so that one end will have substantial contact with the dock or loading platform and the other end with the transport vehicle to prevent the dock board from rocking or sliding. They shall also have a high friction surface designed to reduce the possibility of employees or forklifts slipping.
4. Dock boards/bridge plates shall be marked conspicuously with their rated carrying capacity, and that capacity shall not be exceeded.
5. Portable dock boards/bridge plates shall be secured in position either by being anchored or by being equipped with devices that will prevent their slipping. To facilitate safe handling, portable dock boards/ bridge plates shall have built-in hand holds or fork loops/lugs.

31.5 Annual Fork Inspection Criteria

Annual Fork Inspection Criteria	
Surface Cracks	The fork shall be throroughly examined for cracks with special attention being paid to the heel and welds attaching all mounting components to the fork blank.
Straightness	The straightness of the upper face of the blade and the front face of the shank shall be checked. The fork straightness shall not exceed 0.5% of the length of the blade and/or the height of the shank.
Fork Angle	Any fork shall not exceed a deviation of >3° from the original specification between the upper face of the blade to the load face of the shank.
Fork Tips	The difference in height between the fork tips when mounted on the fork carrier shall not exceed 3% of the length of the blade.
Positioning Lock	When provided, it shall be confirmed that the fork positioning lock is in good repair and correct working order.
Wear	The fork blade and shank shall be checked for wear, especially in the vicinity of the heel. A thickness reduction of ≥10% of the original thickness is cause for rejection. Excessive wear of fork hooks (due to wear, crushing, or other deformation) which show excessive clearance between the fork and fork carrier is also cause for rejection.
Markings	If the fork load rating marking is not clearly legible, it shall be renewed. (For example, 1500 x 24 means 1500-lb load rating at 24-in. load center.)

32 Grinding and Cutting

1. All grinding tools shall be equipped with safety guards.
2. Guards shall be mounted to maintain proper alignment with the wheel.
3. Cup wheels over two inches in diameter used for external grinding shall be protected by either a cup guard or a band type guard.
4. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 180°.
5. Before mounting a new wheel, check it to ensure it is rated for the maximum operating speed marked for the machine. The following calculation may be used to determine adequate rating: SFPM = 3.1416 x Diameter x RPM
6. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place.
7. Only use grinding wheels which are designed to fit the flange.
8. Whenever a handle or guard must be removed to complete a work activity, a Job Safety Analysis must be completed and approved by the employee's immediate supervisor.
9. Always keep guards in place on the grinders.

   Exception: When an employee is unable to do a job using a grinding rock three inches or less in diameter, one quarter inch or less in thickness, and less than 9500 SFPM (surface feet per minute), or a cut-off wheel with the tool guard on the tool, the guard may be taken off provided they wear proper clothing and protective equipment which includes at a minimum: long sleeves, level 7 cut resistant gloves, Kevlar sleeves, and hard hat with full face shield or welding hood. The guard shall be replaced when finished.

10. All abrasive wheels must be at operating speeds with safety guards in place for at least one minute before applying work to the wheel. During this time, no one will stand in front of or in line with the wheel.
11. At a minimum, a face shield over standard goggles or face shield over safety glasses with side shields, hard hats, hearing protection and gloves shall be used whenever portable grinders are used.
12. When removing PPE such as hoods, goggles, and face shields, tilt your head forward so that particles do not enter the eyes.
13. Vacuum clothing and PPE before removing, when possible.
14. Never carry a grinder by the cord or hose.
15. Never yank the cord or the hose to disconnect it.
16. Keep cords and hoses away from heat, oil, and sharp edges.
17. Disconnect grinders when not in use, before servicing, and when changing abrasive wheels. Follow instructions in the user's manual for lubricating and changing accessories. Do not hold a finger on the switch while carrying a plugged-in grinder.
18. Route power cords or hoses around or over traffic areas and other hazards.
19. Portable grinders shall not be used in atmospheres containing or likely to contain explosive gases or airborne coal dusts.
20. Constant pressure switches shall be used on grinders. They may have a lock-on control, provided that turnoff can be accomplished by a single motion of the same fingers that turn it on.
21. Set up screens to protect nearby workers from being struck by flying fragments around grinders.
22. Grinding and cutting activities near medium voltage switchgear have the potential to contaminate the switchgear and cause an arc flash. Take precautions to make sure foreign materials from grinding and cutting activities do not contaminate switchgear or other sensitive equipment.
23. Visually inspect portable grinders prior to use.
24. Visually inspect the wheel and wire brushes for defects.
25. Formal inspections by qualified persons shall be conducted annually.
26. Remove defective tools shall be removed from service and tag them until repaired or disposed.

33 Guarding Floor and Wall Openings

1. A standard railing shall guard stairway floor openings. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway).
2. Every ladderway floor opening or platform shall be guarded by a standard railing with standard toe board on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.
3. Every hatchway and chute floor opening shall be guarded by one of the following:
    a. Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached thereto to leave only one exposed side. When the opening is not in use, the cover shall be closed, or the exposed side shall be guarded at both top and intermediate positions by removable standard railings.
    b. A removable railing with toe board on not more than two sides of the opening and fixed standard railings with toe boards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use.
    c. Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

4. A standard skylight screen or a fixed standard railing on all exposed sides shall guard every skylight floor opening and hole.
5. A floor opening cover of standard strength and construction shall guard every pit and trapdoor floor opening, infrequently used. While the cover is not in place, the pit or trap opening shall be
6. Constantly attended by someone or shall be protected on all exposed sides by removable standard railings.
7. A standard manhole cover, which need not be hinged in place, shall guard every manhole floor opening. While the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable standard railings.
8. Every temporary floor opening shall have standard railings or shall be constantly attended by someone.
9. Every floor hole into which persons can accidentally walk shall be guarded by either:
    a. A standard railing with standard toeboard on all exposed sides, or
    b. A floor hole cover of standard strength and construction. While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.
10. Every floor hole into which persons cannot accidentally walk (because of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than 1-inch wide. The cover shall be securely held in place to prevent tools or materials from falling through.
11. Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width to less than 20 inches.

33.1 Wall and Floor Openings

1. Every wall opening from which there is a drop of more than 4-ft shall be guarded by one of the following:
    a. Rail, roller, picket fence, half door, or equivalent barrier. Where there is exposure below to falling materials, a removable toeboard or the equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4-ft above floor level and of standard strength and mounting.
    b. Extension platform onto which materials can be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications.
2. One or more of the barriers shall guard every chute wall opening from which there is a drop of more than 4-ft.
3. Every window wall opening at a stairway landing, floor, platform, or balcony, from which there is a drop of more than 4-ft, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work, or standard railing.
4. Where the window opening is below the landing, or platform, a standard toe board is required.
5. Every temporary wall opening shall have adequate guards.
6. Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 4 inches above the floor, and the far side of the hole more than 5-ft above the next lower level, the hole shall be protected by a standard toe board, or an enclosing screen either of solid construction.

33.2 Protection of Open-Sided Floors, Platforms, and Runways

1. A standard railing or the equivalent on all open sides except where there is entrance to a ramp, stairway, or fixed ladder shall guard every open-sided floor or platform 4-ft or more above adjacent floor or ground level. The railing shall be provided with a toe board wherever, beneath the open sides:
    a. persons can pass,
    b. there is moving machinery, or
    c. there is equipment with which falling materials could create a hazard.
2. A standard railing or the equivalent on all open sides 4-ft or more above floor or ground level shall guard every runway. Wherever tools, machine parts, or materials are likely to be used on the runway, a toe board is required on each exposed side.
3. Runways used exclusively for special purposes may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a runway of not less than 18 inches wide. Where persons entering upon runways become exposed to machinery, electrical equipment, or other danger that is not a falling hazard, additional guarding may be required for protection.
4. Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment shall be guarded with a standard railing and toe board.

33.3 Stairway Railings and Guards

1. Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails as follows with the width of the stair to be measured clear of all obstructions except handrails.
    a. On stairways less than 44-in wide having both sides enclosed, at least one handrail, preferably on the right-side descending.
    b. On stairways less than 44-in wide having one side open, at least one stair railing on open side.
    c. On stairways less than 44-in wide having both sides open, one stair railing on each side.
    d. On stairways more than 44-in wide but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.
    e. On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.
2. Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 inches.

33.4 Railing, Toe boards and Cover Specifications

1. A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp
2. level. The top rail shall be smooth surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhand does not constitute a projection hazard.
3. A stair railing shall be of construction similar to a standard railing, but the vertical height shall be not more than 34 inches or less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.
4. For wood railings, the posts shall be at least 2-inch by 4-inch stock spaced not to exceed 6 feet; the top and intermediate rails shall be of at least 2-inch by 4-inch stock. If the top rail is made of two right-angle pieces of 1-inch by 4-inch stock, posts may be spaced on 8-foot centers, with 2-inch by 4-inch intermediate rail.
5. For pipe railings, posts and top and intermediate railings shall be at least 1-1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.

6. For structural steel railings, posts, and top and intermediate railings shall be at least 1-1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.
7. For structural steel railings, posts, and top and intermediate rails shall be of 2-inch by 2-inch by 3/8-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than 8 feet on centers.
8. The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail.
9. Other types, sizes, and arrangements of railing construction are acceptable provided they meet the following conditions:
    a. A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of 42 inches nominal.
    b. A strength to withstand at least the minimum requirement of 200 pounds top rail pressure.
    c. Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail.
    d. A standard toeboard shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension.
10. Where material is piled to such height that a standard toeboard does not provide protection, paneling from floor to intermediate rail or to top rail is required.
11. A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail to offer no obstruction to a smooth surface along the top and both sides of the handrail.
12. The handrail shall be of rounded or other section that will furnish an adequate handhold for anyone grasping it to avoid falling. The ends of the handrail shall be turned into the supporting wall or otherwise arranged so as not to constitute a projection hazard.
13. The height of handrails shall be not more than 34 inches or less than 30 inches from upper surface of handrail to surface of tread in line with face of riser or to surface of ramp.
14. The size of handrails shall be:
    a. When of hardwood, at least 2 inches in diameter.
    b. When of metal pipe, at least 1-1/2 inches in diameter.
    c. The length of brackets shall be such as will give a clearance between handrail and wall or any projection thereof of at least 3 inches.
    d. The spacing of brackets shall not exceed 8 feet.
15. The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point on the rail.
16. All handrails and railings shall be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.
17. Floor opening covers may be of any material that meets the following strength requirements:
    a. Trench or conduit covers and their supports, when located in plant/facility roadways, shall be designed to carry a truck rear-axle load of at least 20,000 pounds.
    b. Manhole covers and their supports, when located in plant/facility roadways, shall comply with local standard highway requirements, if any; otherwise, they shall be designed to carry a truck rear-axle load of at least 20,000 pounds.
    c. The construction of floor opening covers may be of any material that meets the strength requirements. Covers projecting not more than 1 inch above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over 30°. All hinges, handles, bolts, or other parts shall set flush with the floor or cover surface.

18. Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or of slat work with openings not more than 2 inches wide with length, unrestricted.
19. Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward) at any point on the top rail or corresponding member.
20. Wall opening grab handles shall be not less than 12 inches in length and shall be so mounted as to give 3 inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the handle.
21. Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grillwork with openings not more than 8 inches long or of slat work with openings not more than 4 inches wide with length unrestricted.

34 Heat Stress

1. Work in environments that may cause heat stress is subject to TVA-TSP-18.906, Heat Stress.
2. To help prevent heat stress:
   a. When possible, wear loose-fitting, lightweight, light-colored clothing.
   b. Consider the effects of extra clothing such as Tyvek coveralls on your body's ability to tolerate heat.
   c. Consider physical factors in your body's ability to tolerate heat. Medical conditions, medications and sunburn can reduce your ability to tolerate heat.
   d. Drink plenty of fluids.
   e. Let your body acclimate to the heat.
   f. Do not exceed stay times and take breaks.

35 Heavy Equipment Operations

1. Do not operate equipment unless you are qualified on that specific equipment. The manager/supervisor/foreman responsible for heavy equipment use must ensure operators are trained and certified for each type of equipment assigned.
2. Operators assigned to operate heavy equipment which requires a Commercial Driver's License must meet the requirements set forth in TVA-TSP-18.609, Commercial Motor Vehicles.
3. Heavy equipment operators and drivers shall complete an orientation and knowledge survey by completing TVA Form 20707, Heavy Equipment Operator/Driver Initial Checkout.
4. Operator certification requires the operator to demonstrate actual safe use of each type of equipment assigned.
5. Management may require an operator/driver to repeat the orientation, knowledge survey (TVA Form 20707) and demonstrate actual safe use of each type of equipment assigned after a heavy equipment event.
6. Copies of the equipment manufacturer's instruction manual, including applicable build sheets, must be kept with each machine and all operators instructed to refer to it whenever any doubts concerning operating procedures become apparent. Operators shall consult with their supervisor/foreman in the event the manual does not cover a specific situation.
7. All drivers and operators involved in accidents while operating heavy equipment shall be drug and alcohol tested in accordance with TVA policies.

8. Excavation or earth removal will require more detailed planning and preparation of an Excavation Permit (reference Excavation and Trenching Safe Work Requirements). Planning shall include safe clearance under power lines and other low overhead obstructions, such as plant piping; narrow bridges; capacity of bridges/grating that must be crossed; roadbed stability; roadway clearance around curves; traffic to be encountered; underground utilities that may be damaged; etc. The supervisor/foreman and the operator shall do the planning jointly.
9. Planning for the actual site work shall include a survey of nearby power lines and proper clearance, locations of underground utilities, and other unique hazards.
10. If site clearing is planned, where large trees with low limbs and high underbrush are present, use only equipment with heavy, well-supported, arched steel mesh canopies to protect operators from falling dead limbs. An alternative to alleviate such hazards is to cut the roots of the tree with dead branches on three (3) sides and then apply the power to the fourth side. A long cable may be used to pull over large dead trees, but it must be determined in advance that the tractor and operator will be in the clear when the tree falls.
11. Where the site work may be remote from the plant or facility, pre-job planning shall also include a method of communication if the employee is injured or becomes ill. The planning shall also include contingencies for severe or inclement weather.
12. Nighttime operations are not recommended. If they must be conducted, flood lighting approximating daylight around the equipment shall be provided. Signal persons shall be provided with reflective gloves (orange or red), a spotter's jacket, and a safety hat with a coupleof strips of reflectorized tape on it to assist the operator in spotting the signal person.
13. Move equipment on plant/site roadways during the daylight. If equipment must be moved at night, the equipment shall be driven entirely off the road if possible. Warning flags and/or reflective markers shall be placed at the ends of the projecting blades.
14. If equipment must remain parked where any portion projects into a road, day or night, the equipment shall be adequately marked with barricades, red flags, red lights, or flares.
15. When equipment is in use on a section of road, place barrier signs at both ends and at sufficient distances from the operation to warn oncoming traffic. Advanced warning signs shall be placed at least 1,500 feet from the starting point of the operations or barricade on the road/ highway and a greater distance if traffic speed warrants. Instructive and informational signs shall also be placed between the advance warning signs and at the start of the operations.
16. Where operations are extensive, station flagmen where they are visible to oncoming traffic for at least 500 feet. When possible, detour all traffic by way of another road around the work site.
17. Do not stop or turn equipment on a curve or at the crest of a hill, unless you can clearly see approaching traffic for at least 1000 feet. Flagmen shall be stationed at both ends of the turning operation to warn of approaching traffic.
18. Consult the state transportation office, state highway department, or other appropriate governing body prior to accessing or using public roadways.
19. Plant/sites shall develop and communicate traffic rules for haul roads and job roadways that give loaded equipment the right of way. Stop signs shall be placed to govern entry of light duty vehicles and cars and other equipment into haul roads or operating areas.
20. Inspections are usually of three types: periodic (annually), frequent (monthly), and daily. The supervisor/foreman shall ensure qualified persons perform these inspections and that identified deficiencies are promptly corrected. Equipment shall not be assigned for work if there are deficiencies that have not been corrected.
21. Daily shift inspections shall be performed on the equipment assigned for operation by the operator. Deficiencies shall be reported so that corrective action can be taken.
22. Document inspections on TVA Form 20308, Heavy Equipment Check Sheet Operator/Driver Pre-Operational Inspection. Retain TVA Form 20308 for a minimum of 30 days or in accordance with site documentation retention policies.
23. Before starting the operation, test all motions of the equipment, including the brakes.
24. Never jump from the equipment to the ground.

25. Do not dismount while the equipment is in motion. Maintain three points of contact using handholds and steps to climb on and dismount the equipment.
26. Evacuate equipment immediately you see or smell fire. Report the fire immediately to your supervisor.
27. Keep steps and running boards clear of ice, mud, grease, and oil.
28. Before moving earth-moving equipment, make certain that no personnel or equipment is in the danger area around the equipment. Walk around the machine before starting.
29. Operate machines at normal speeds and in a manner consistent with conditions of the job.
30. When necessary to drive off the shoulders of roads, proceed slowly to avoid sudden tilting.
31. When parking a machine, ensure the engine is shut off, bowls or blades are dropped, and other attachments such as rippers and scarifiers are lowered to the ground.
32. Do not leave a machine unattended while its motor is running.
33. Do not allow other personnel to ride on equipment while the equipment is in motion, except for training purposes, and then only when a seat is provided. Do not allow anyone to climb on equipment in motion.
34. Do not use cell phones during the operation heavy equipment. This includes talking, texting or use of any applications which may be on the phone.
35. Exercise extra caution when operating heavy equipment in congested areas. Identify specific hazards prior to work. Use mitigation measures such as barricades, vested flaggers, etc. to prevent injury to personnel or damage to equipment and structures.
36. When remote field refueling must be accomplished:
    a. The equipment shall be shut off.
    b. Use only approved fuel dispensing equipment.
    c. Have a fire extinguisher nearby.
    d. Do not smoke.
    e. Electrically bond the dispenser and the equipment if flammable fuel is being transferred.
    f. Before maintaining/greasing heavy equipment:
    a. Ensure the equipment is de-energized using TVA-TSP-18.615, Lockout/Tagout, or business unit or equipment specific instructions for ensuring equipment will not unexpectedly move during maintenance activities.
    b. Conduct a pre-job briefing with all personnel involved in the maintenance activity to ensure everyone understands their role and safe positioning while maintenance or testing is underway.
    c. Ensure non-necessary personnel stand clear of the machine should the equipment inadvertently move.

35.1 Lifting Loads with Heavy Equipment

1. Heavy equipment can only be used to lift suspended loads in accordance with manufacturer's instructions. All requirements of the manufacturer's operating manual including strict compliance with manufacturer's load chart must be met.
2. Lifting eyes on buckets must have a manufacturer's capacity on the eye. If a lifting eye (lifting lug) is added, it must have documented engineering approval and a rated capacity.
3. Lifting beam attachments must be of the same manufacturer as the equipment with a manufacturer supplied load chart unless other lifting beam attachments have documented engineering approval and a load chart for the equipment on which it will be used.
4. All rigging must be in accordance with TVA-TSP-18.721, Rigging

35.2 Field Maintenance

1. When field maintenance is required, the operator will set the brakes, secure the boom, lower the dipper or bucket to the ground, take the machine out of gear, and take other appropriate actions to prevent accidental movement.

2. Before starting any field maintenance, the mechanic shall notify the operator of the nature and location of the problem.
3. If the repair work is to be done on or near moving parts, the controls will be locked out and tagged. The mechanic shall be the only one to remove the lock and tag.
4. Parts that must be in motion while mechanics are working on them shall be turned slowly, by hand, if possible, in response to guidance or on signal. This precaution applies to work around gears, sheaves, and drums. A cable being wound on a drum shall be guided with a bar.
5. If guards must be removed for the maintenance work, they must be replaced.
6. Employees working on heavy equipment in the field where the work requires the employee to work higher than 4 feet off the ground may work without fall protection as this is not a
    g. walking/working surface as defined by OSHA and is specifically exempt from fall protection requirements. Employees must plan the work, ensure the working surface is free of grease, mud, oil, etc. and take extra precautions to prevent falls.

35.3 Servicing Tires

1. Only heavy equipment mechanics shall change heavy equipment tires.
2. When inflating heavy equipment tires while in the field:
    a. Follow the correct procedures for the type of wheel being serviced.
    b. Understand the hazards involved with inflating heavy equipment tires.
    c. Adhere to the data in the rim manual charts.
    d. Follow Inflation procedures and rim inspection procedures.
    e. Install the restraining device around the tire. Inspect the restraining device prior to use for bent parts, corrosion damage, or other signs of weakness.
    f. When a rim wheel is in a restraining device, do not rest or lean any part of your body or equipment on or against the restraining device.
    g. Even though the tire is within the restraining device, stand outside the trajectory of a potential explosion.
3. After tire inflation, inspect the tire and wheel components while still within the restraining device to make sure they are properly seated and locked. No adjustments shall be made by the operator.
4. An air line assembly consisting of the following components shall be used for inflating tires:
    a. A clip-on chuck
    b. An inline valve with a pressure gauge or pre-settable regulator
    c. A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.

35.4 Towing

1. The towing tractor operator shall ensure that all personnel are clear before backing to couple-up. If a ground worker is assisting, the operator shall not move until signaled.
2. The towing tractor shall be stopped, the shift lever placed in neutral, and the brakes set before any workers are allowed to couple the trailing equipment. Wheels of the equipment being coupled shall be chocked.
3. A safety chain, in addition to the regular hitch or draw bar, is required for all equipment being towed.

35.5 Parking Requirements

1. Park heavy equipment in a manner that will prevent undesired movement. Set the brakes, land blades, and buckets on the ground and place shift lever in neutral before leaving the equipment in the field at the end of the work shift.
2. Block/chock wheels on wheeled equipment if the equipment is parked on a grade.
3. Disconnect electrical systems along with the master switch, if provided.

4. When equipment is stored indoors overnight or for maintenance purposes, keep the equipment away from flammable materials, welding operations, and heating units.

35.6 Backhoes

1. Extend outriggers for all digging.
2. Use caution when setting up and operating near the edge of an excavation.
3. Limit the size of the shovel bite to avoid using excessive power.
4. Do not fill buckets to the point the bucket overflows.
5. Do not swing loads over employees. Remain aware of employees who may be in or near the excavation.
6. Do not do any digging when there is near an employee in the excavation.

35.7 Bulldozers

1. Keep bulldozer blades close to the ground for balance when the machine is traveling up a steep grade.
2. When a bulldozer is to be ridden down a slope, doze three or four bowls of dirt to the edge of the slope.
3. If the dirt is lost on the way down the slope, do not lower the blade to regain the load.
4. Do not use bulldozer bowls as a brake for going down a steep slope except in emergencies.
5. Avoid side hill travel whenever possible. Drive up and down the slope to avoid tipping over. However, if side hill travel is necessary, reduce the possibility of tipping by tying the machine (using a rope) to another machine stationed at the top of the hill. This action requires approval of the plant/site safety professional and the manager of the operation. Planning for this operation shall be documented.
6. Ensure all workers are standing clear before pushing over trees, bulldozing rocks, and rolling logs.
7. In clearing operations, expect the greatest danger to occur from falling limbs or timber. Recognize dead limbs or dead tops as definite hazards. Avoid abrupt contact with the butt of a tree as limbs may drop on top of the machine or personnel nearby. I
8. Be alert to dangers from overhanging dirt and rocks when excavating.

35.8 Draglines and Power Shovels

1. Cranes used as draglines that are mounted on barges shall be secured to prevent the crane from moving because of barge movement/list.
2. Since load rating of the crane may be reduced in order to stay within the limits for list of the barge, when mounted on a barge, a new load-rating chart shall be calculated and provided. This calculation must be made on the drag bucket capacity and the radius of the lift, taking into account the swing of the load. Lifting to the side of a barge will tend to make the barge list more than if the lift radius is confined to the end of the barge. The capacity and limitations of use shall be based on competent design criteria and the criteria shall be filed at the plant/site.
3. The load-rating chart with clearly legible letters and figures shall be provided and securely fixed at a location easily visible to the operator.
4. The operator and other employees are required to use personal flotation devices.
5. Cranes used as draglines for ash pond work that are not mounted on barges shall be set up on firm footing. Such footing may require the use of cribbing to ensure that the crane is not tipped from the shifting of the ground and that the crane is level.
6. Load swings shall be smooth and at a slow to moderate pace.

35.9 Front End Loaders

1. Do not travel at excessive speeds.
2. Use caution when carrying a load. Carry loads at a height that is safe and does not restrict vision.

3. Always wait until the dumping point is reached before hoisting the bucket.
4. Keep tires properly inflated and do not exceed the machine load rating.
5. Riders are not allowed on front-end loaders.
6. Front-end loaders without a rollover protection structure (ROPS) shall not be used. Exceptions to this requirement must be approved by TVA Corporate Safety and the Management Official In Charge (MOIC).
7. A seat belt must be provided and used by the operator when operating a loader.
8. Do not use loaders as a work platform or staging.
9. Use caution in backing a loader. Use side and rearview mirrors. Keep the mirrors clean and properly adjusted. In a congested area, particularly with pedestrian workers present, a signal person shall be used to signal the operator in backing.
10. When loading a truck, load it from the truck driver's side whenever possible. The loader operator and truck driver shall agree where the truck driver will stay while the truck is being loaded. The truck driver must remain in the cab or away from both the truck and the loader. The truck driver shall never be on the truck body when loading is being accomplished.
11. When a loader is required to operate near excavations, use beams or stop logs to guard the edge to minimize the possibility of the machine running off the side.
12. When descending grades with a loader, regulate the speed, leave the engine engaged, place the transmission in a low range, and carry the bucket as low as possible and tilted back.
13. Try to back down a descending grade with a load.
14. Do not use the bucket as a braking mechanism.
15. Ground the buckets when leaving the operator's seat. If a bucket must be elevated, ensure it is securely blocked to prevent sudden drop.

35.10 Graders

1. Be alert for rocks, logs, and trees when sloping banks.
2. Never coast downhill. Keep the grader in gear at all times.

35.11 Scrapers

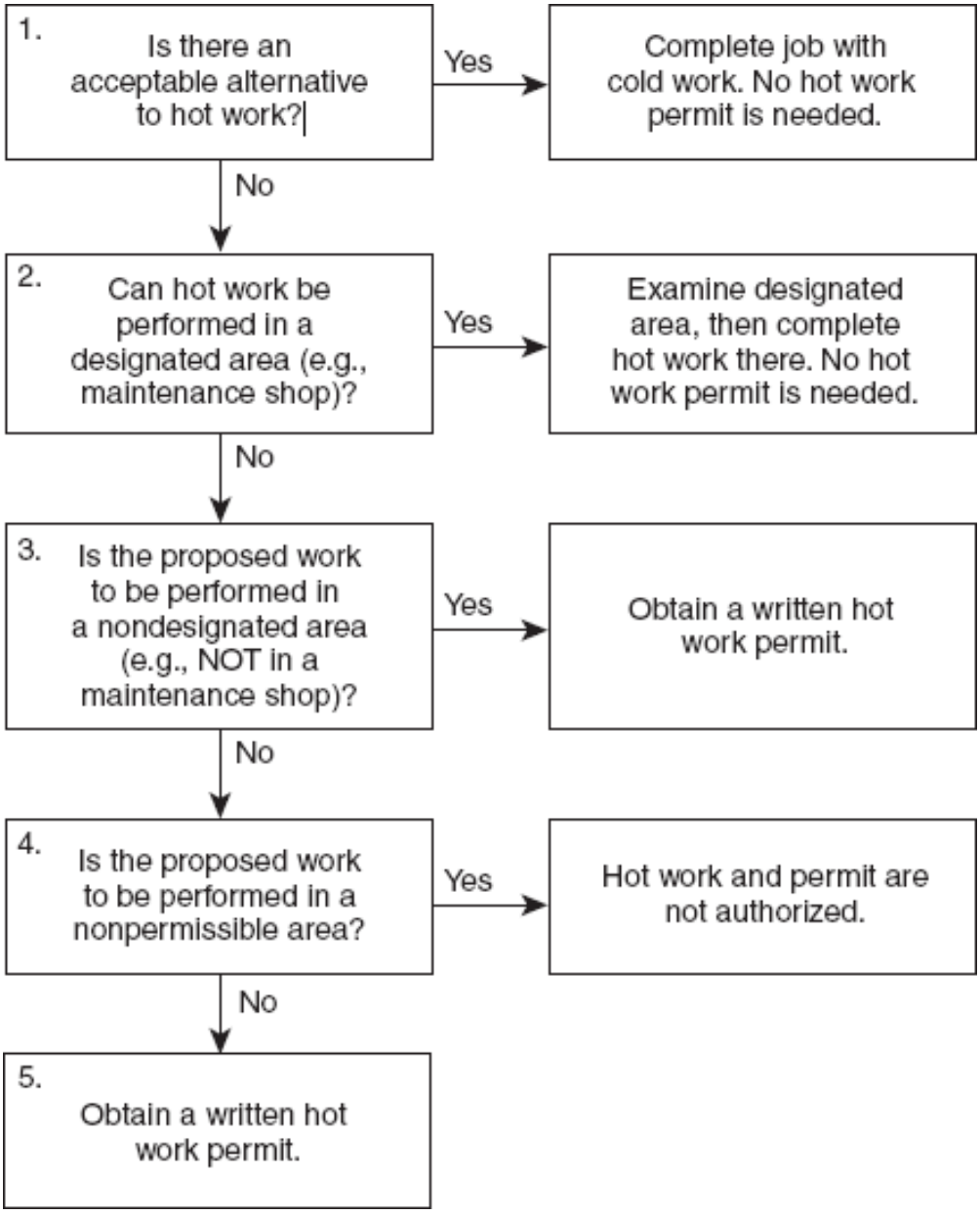
1. When towing a scraper from job-to-job, ensure maximum clearance for road projections.
2. If a scraper bowl safety latch is provided, it is required to be used.
3. Leave the machine in gear and use retarders to control speed and/or use brakes as a secondary speed control when going downhill.
4. Use caution when operating near the edges of coal piles.

36 Hot Work and Ignition Control

1. Use the Hot Work Decision Tree in this section to determine if a Hot Work Permit is necessary.
2. Use TVA Form 6561A, Hot Work Permit. for all hot work activities performed outside of designated shop "hot work areas".
3. Consider alternative methods to hot work for every job.
4. Do not perform hot work until all special precautions have been taken to safeguard the area.
5. Report any equipment defect or hazard to your supervisor. Do not use defective equipment.
6. Fire extinguishers permanently installed in plant buildings and structures are available to be used by hot work fire watches but may not be removed from the permanent location unless required for use on a fire. When permanently installed fire extinguishers are being relied on by hot work fire watches, they must be properly rated for the hazard.
7. Inspect all equipment before being used.
8. Turn off all welding equipment when not in use.
9. Do not place material being welded or cut directly on a concrete floor.
10. Cool or clearly mark hot material before leaving it unguarded.

11. Disable automatic fire detection devices present in the immediate area (as necessary) to prevent nuisance alarms and/or actuation of suppression systems. Follow site specific fire protection impairment procedures.
12. Hot work near hazardous materials or on equipment containing hazardous materials may require special precautions and respiratory protection. Consult TVA Safety for guidance.
13. Adequate ventilation or respiratory protection is required while welding in confined spaces or on zinc, brass, bronze, stainless steel, galvanized, or lead-coated materials.
14. Before performing hot work on a painted surface, determine if the paint or undercoat contains harmful contaminants such as PCB's. lead or cadmium. If these substances are present, the material shall not be cut or welded until necessary precautions are taken.
15. Do not perform welding or cutting operations in areas containing combustible gases, vapors, or dust until all precautions have been taken to safeguard the area from fire or explosions.
16. Open flames shall not be brought near, and welding or soldering shall not be done on any vessel which may have contained flammable or explosive substances until the vessel has been thoroughly purged by steam, or filled with water, or otherwise handled by special approved safety procedures.
17. When conducting hot work from elevated locations:
    a. Prevent hot slag from falling on people or on to combustible materials.
    b. Where flammable/combustible material cannot be removed from exposure to sparks/slag, protect it with a shield of noncombustible or fire-resistant material.
    c. Close off the work area beneath the hot work by barricades or other effective means.
18. Take precautions to prevent activation of a sprinkler head or accidental operation of automatic fire detection or suppression systems.
19. Where combustible materials are on the floor:
    a. The floor shall be made clean for a radius of 35-ft (50-ft for areas with flammable/combustible liquids), and the following criteria also shall be met:
    b. Combustible floors shall be kept wet, covered with damp sand, or protected by a listed/approved welding blanket, welding pad, or equivalent.
    c. Where floors have been wet down, personnel operating arc-welding equipment or cutting equipment shall be protected from possible shock exposures.
20. If hot work is done on one side of a wall, partition, ceiling, or roof, one of the following criteria shall be met (unless the barrier does not transmit heat through it):
    a. Take precautions to prevent ignition of combustibles on the other side by relocating the combustibles.
    b. If it is impractical to relocate combustibles, an additional fire watch shall be provided on the side opposite from where the work is being performed.
21. Use a listed/approved welding blanket, welding pad, or equivalent when:
    a. Relocation of combustible materials at least 35-ft in all directions from the work site, cannot be achieved.
    b. Openings or cracks in walls, floors, or ducts within 35-ft of the work exist. To prevent the entrance of sparks, the edges of covers at the floor shall be tight, including at the point at which several covers overlap where a large pile is being protected.
    c. Hot work is done near walls, partitions, ceilings, or roofs of combustible construction.

Hot Work Decision Tree



36.1 Hot Work Permits

1. The Permit Authorizing Individual (PAI) authorizes the issue of the permit and shall:
    a. Ensure ducts and conveyor systems that might carry sparks to distant combustibles are shielded, shut down, or both.
    b. Ensure no work is attempted:
        i. On a partition, wall, ceiling, or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich type panel construction.
        ii. n pipes or other metal that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles if the work is close enough to cause ignition by conduction unless mitigation steps are taken.
    c. Determine that fire protection and extinguishing equipment are present.
    d. Issue the Hot Work Permit and ensure the permit is at the work location.
    e. Inspect the area at least once per shift while the hot work permit is in effect to ensure that it is a fire-safe area and the requirements on the permit are being followed.
    f. Re-inspect the work area and re-validate the permit at the beginning of each work shift the hot work activity remains in progress.
    g. Maintain copies of all Hot Work Permits for 90 days.
    h. Extend the protected distances and areas as necessary in instances where the hot work results in the possible travel of slag, sparks, spatter or other sources of ignition further than 35-ft, (50-ft with flammable/combustible liquids).
    i. Assign additional fire watches when necessary, such as where hot work is performed near open shafts or at elevated heights or where sparks can travel through spaces such as openings.
    j. Extend the time a fire watch is necessary if fire hazards warrant the extension.
2. Upon completion of the hot work activity, the PAI ensures:
    a. Equipment used to perform hot work has been removed from the area.
    b. Fire detection system/equipment is restored to operable status.
    c. Work area is cleaned in accordance with site housekeeping standards.
    d. That the designated fire watch maintains surveillance in the work area as specified in the permit.
3. When performing hot work under a hot work permit, employees shall:
    a. Have the PAI's approval (and written permit) before starting any hot work.
    b. Determine any fire hazards that are present or likely to be present.
    c. Inspect all equipment to ensure a safe operating condition prior to use.
    d. Ensure hot work activities are performed in a safe manner. Cease hot work operations if unsafe conditions develop and shall immediately notify the PAI of the situation.
    e. Protect combustibles from ignition. Properly shield combustibles against ignition if impractical to relocate the combustibles.
    f. Ensure equipment being used remains in good operating condition.
4. The Fire Watch shall:
    a. Be currently trained in accordance with TVA's Fire Watch training program to understand the inherent hazards of the work site and of the hot work.
    b. Have fire extinguishing equipment readily available that is to be properly rated, inspected, and adequately sized for the task involved.
    c. Be permitted to perform additional tasks, but those tasks shall not distract them from their fire watch responsibilities. These tasks might include moving partitions relating to
    h. the hot work, cleaning in the immediate area, and minimal assistance to the person performing hotwork.
    d. Remain at the site and maintain surveillance in the work area to detect and extinguish smoldering fires, only when the fires are within the capacity of the equipment available. If the fire is not within the capacity of the equipment, the fire watch shall sound the fire alarm immediately.

e. Have the responsibility to make certain the hot work area is maintained in a fire-safe condition and have the authority to stop the hot work if unsafe conditions are observed.
f. Understand the construction involved with the hot work area and the hazards associated with the occupancy
g. Understand the fire exposure hazard that hot work creates to occupancies adjacent to or below the hot work operation.
h. Understand the need to maintain proper isolation of all hot work operations from combustible or flammable materials.
i. Remain on fire watch duty for at least 30-minutes after completion of hot work operations.
j. Remain on duty for not less than 2-hours after completion of hot work operations in areas with combustible dust potential, including coal handling,

5. One fire watch is permitted to cover multiple hot work activities provided they are on the same elevation, within 50-ft, and can see all areas.

36.2 Welding and Cutting

1. Wear proper PPE when welding or cutting.
2. Do not observe welding operations and personnel working adjacent to welding operations without adequate eye protection.
3. Do not wear highly combustible clothing such as polyester when performing welding and cutting operations.
4. Fasten clothing around wrists and neck and ensure pants cover the shoe tops. Do not roll up shirtsleeves and trouser legs.
5. Where exhaust ventilation systems are used to control welding fumes, those systems shall be tested at one-year intervals for adequate capture velocity.

36.2.1 Electric Welding

1. Properly ground electric welding machines before use.
2. Ensure gauges are in good operating condition and tested periodically for accuracy.
3. Ensure adequate ventilation is used when any internal combustion engine-driven arc welders are operated in a building, or in enclosed or confined spaces.
4. Place or protect electrode holders in a manner that electrical contact cannot be made with employees or conducting objects, fuel or compressed gas tank when left unattended or not in use.
5. Turn the power supply switch off when leaving the work area, stopping work for any appreciable length of time or when the welding machine is to be moved.
6. Inspect the welding machine, cables, holders, and ground clamp before each use, and maintain in safe working condition.
7. Ensure welding cables are:
    a. Positioned to avoid creating hazardous obstructions.
    b. Placed to avoid causing tripping or falling hazards and to prevent damage to them including damage from hot slag or sparks from the welding operation. If placed across areas where others must walk, place WARNING signs to warn others of the trip hazard.
    c. Not dragged over rough surfaces, or through water, oil, or grease, or permitted to lay on wet surfaces.
    d. Examined at frequent intervals for damage, worn places, and loose connections.
8. Use welding screens whenever other persons could be exposed to the arc of the welding operation.
9. Do not strike an arc with an electrode without first alerting persons nearby to the possible danger.
10. Protect terminals for welding leads from accidental electrical contact by personnel or by metal objects i.e., vehicles, crane hooks, etc.
11. Before starting operations, check all connections to the welding machine to make certain they are properly made.

12. Do not coil or loop welding electrode cable around your body.
13. If a welding lead terminal which is intended to be used exclusively for connection to the work is connected to the grounded enclosure, use a conductor at least two (2) AWG sizes smaller than the grounding conductor and. marked to indicate that it is grounded.
14. When installing Arc Welding Equipment:
    a. Conduits containing electrical conductors shall not be used for completing a work-lead circuit.
    b. Pipelines shall not be used as a permanent part of a work-lead circuit, but may be used during construction, extension or repair, providing current is not carried through threaded joints, flanged bolted joints, or caulked joints and that special precautions are used to avoid sparking at connection of the work-lead cable.
    c. Chains, wire ropes, cranes, hoists, and elevators shall not be used to carry welding current.
    d. Where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, joints shall be bonded or provided with adequate current collecting devices.
    e. All ground connections shall be checked to determine that they are mechanically strong and electrically adequate for the required current.
15. A disconnecting switch or controller shall be provided at or near each welding machine.
16. Overcurrent protection shall be provided.
17. A disconnect switch with overload protection or equivalent disconnect and protection means, shall be provided for each outlet intended for connection to a portable welding machine.
18. For individual welding machines, the rated current-carrying capacity of the supply conductors shall be not less than the rated primary current of the welding machines.
19. For groups of welding machines, the rated current-carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied. The conductor rating shall be determined according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time.
20. In operations involving several welders on one structure, DC welding process requirements may require the use of both polarities; or supply circuit limitations for AC welding may require distribution of machines among the phases of the supply circuit. In such cases no load voltages between electrode holders will be two (2) times normal in DC or 1, 1.41, 1.73, or 2 times normal on AC machines. Similar voltage differences will exist if both AC and DC welding are done on the same structure.
21. Connect all DC machines with the same polarity.
22. Connect all AC machines to the same phase of the supply circuit and with the same instantaneous polarity.
23. Firmly attach the work lead to the work, free magnetic work clamps from metal particles of spatter on contact surfaces.
24. Spread out coiled welding cable before use to avoid serious overheating and damage to insulation.
25. Grounding of the welding machine frame shall be checked. Special attention shall be given to safety ground connections of portable machines.
26. Always follow the manufacturer's printed rules and instructions.
27. Do not use cables with splices within 10-ft of the holder.
28. Repairs shall be made only by qualified personnel.
29. Dry and thoroughly test machines which have become wet prior to use.
30. Do not use cables with damaged insulation or exposed bare conductors.
31. When joining lengths of work and electrode cables, use connecting means specifically intended for the purpose. Use connecting means with insulation adequate for the service conditions.

36.2.2 Gas Welding and Cutting

1. During extended periods of non-use (periods >24-hrs), remove oxygen/acetylene units from critical areas and stored in designated storage areas.
2. Do not repair or alter gas cylinder valves. Defective equipment shall be repaired or replaced.
3. Do not substitute pressure gauges and regulators provided for use with a particular welding gas on cylinders containing a different gas.
4. Do not use oil and grease with oxygen systems, including lubrication of gauge connections, valves, etc.
5. Ensure oxygen hoses have fittings of a different size and a color different from that of hose used for acetylene connections. Normally oxygen hose lines are green and acetylene hose lines red.
6. Do not use leaking or defective equipment/cylinders/regulators. Remove them to a safe location and tag them defective.
7. Observe any special precautions related to the handling and storage of compressed gases See the Flammable and Compressed Gases section of this manual.
8. Use only hose, fittings, and tools specially designed for use in welding operations.
9. Both oxygen and acetylene lines shall be equipped with combination check valve/flash back arrestors that are listed/approved.
10. The combination check valve/flash back arrestor shall be clearly labeled and shall be installed at the base of the torch.
11. A second combination check valve/flash back arrestor may be installed at the regulator but is not required.
12. Close cylinder valves when welding equipment is not in use. Do not leave pressure on gas regulators or hoses when not in use.
13. Do not store torches connected to cylinders in enclosed toolboxes even if pressure is turned off.
14. Properly secure, use and transport cylinders.
15. Ensure valve protection caps are in place and hand tight, except when cylinders are in use or connected for use.
16. Light torches by means of friction lighters, pilot flames, or similar sources, and not by use of matches or cigarette lighters.
17. Do not light a gas welding torch unless:
    a. The torch valves are closed.
    b. Both the oxygen and gas cylinders have been turned on.
    c. Regulators have been set at the proper pressure for lighting has been attained.
18. Ensure valves and tank fittings fit tight to prevent gas leaks and are tested using soap film or other approved methods. Do not use matches or other open flames for testing.
19. Keep valves of empty cylinders closed and capped.
20. Ensure keys are attached to cylinder valve spindles for instant use during operations.
21. Only operate cylinder valves with hand wheels or tools specifically dedicated for that purpose.
22. Close cylinder valves when welding operations are stopped for more than a brief interval. Momentary stoppage is controlled at the torch valves.
23. Do not drag gas hose lines and air hose lines over rough surfaces, or through water, oil, or grease, lay them on wet surfaces.
24. Place gas hose and air hose lines to avoid tripping or falling hazards and to prevent damage to them including from hot slag or sparks.
25. Do not sleeve oxygen and acetylene lines.
26. Examine hose lines carefully for damage, worn places, and loose connections.
27. Do not make repairs with tape, wire, or copper tubing or by using white lead, oil, grease, or other pipe fitting compounds.
28. Store oxygen cylinder separately from fuel gas cylinder storage or combustible materials by a minimum distance of 20-ft or by a noncombustible barrier at least 5-ft high having a fire resistance of at least $^1/_2$-hour. This separation requirement between oxygen and fuel-gas cylinders does not apply when the cylinders (1 each) is mounted on a portable welding cart.

37 Identification of Piping Systems

1. Employees shall know the contents of the piping system prior to beginning work.
2. Piping and piping systems shall be clearly marked to identify direction of flow and content.
3. All valve and valve operators shall be marked so they are visible from normal point of access.
4. The latest update of ASME Standard A13.1, Scheme for the Identification of Piping Systems may be used as a reference to provide consistency in identification and marking all piping containing potentially hazardous material.
5. Piping systems containing any of the following shall be positively identified by written titles:
    a. Flammable or easily ignited materials.
    b. Toxic, poisonous, or asphyxiating gases or materials.
    c. Corrosive materials
    d. Fire protection materials
    e. Compressed air at or above 30 psig
    f. Potable and nonpotable water
    g. Materials at high pressures
    h. Radioactive substances
    i. Oxidizing materials
    j. Materials at high and low temperatures (above 125°F or below 32°F)
6. Titles shall be applied at frequent intervals sufficient to clearly identify piping contents.
7. Letters and numerals placed on piping shall be legible from the normal field of view, especially from operating positions.
8. Piping systems less than 3/4 inch in diameter may be identified by securely attached nonferrous metal tags or pipe markers contents and direction of flow clearly indicated.

38 Laboratory Safety

1. TVA Personnel working in laboratories must be properly trained.
2. Wear safety glasses with side shields, goggles, or face shields at all times where eye hazards are a possibility. Goggles or face shields are recommended when chemical splashes are possible and may be required if information on the Safety Data Sheet (SDS) indicates goggles and/or face shields are the appropriate PPE.
3. Wear a lab coat or apron, cover legs, and confine loose clothing and long hair when working with corrosive, toxic, or reactive chemicals.
4. When handling corrosive, toxic, or reactive chemicals, wear appropriate gloves in good condition with no holes or tears.
5. To avoid injury or chemical exposure, immediately dispose of all broken glassware in UL approved (puncture resistant/closable/leak-proof/labeled/color coded) containers.
6. Use only the suction devices designed for use with pipettes when pipetting liquids. Never use your mouth for suction for pipetting or initiating a siphon.
7. Wash exposed areas of skin, primarily arms and hands, thoroughly with soap and water at the completion of bench work, before eating, and/or before leaving the laboratory.
8. Keep laboratory bench areas clean of any equipment, glassware, chemicals, etc., except what is actually needed to perform analyses.
9. To the maximum extent possible, perform all chemical handling, transfers, etc., in laboratory fume hood(s).
10. Clean the laboratory and properly store equipment, glassware, and chemicals at the end of each shift.
11. If a toxic/hazardous chemical has made contact with the skin, flush the affected skin with water immediately.
12. Ensure access to electrical equipment shut offs (e.g., plugs, switches, and electrical panels) is kept free from obstructions to allow immediate access in an emergency.
13. All receptacle outlets in laboratory spaces shall be of the polarized grounding type.

14. Use Ground Fault Circuit Interrupters (GFCIs) in locations involving wet processes or outdoor work; GFCIs shall be permanently when outlets are located within 6-ft of sinks.
15. All electrical hand tools used inside laboratories shall be grounded or double insulated.
16. Do not eat, drink, or apply cosmetics in areas where hazardous chemicals are used. Eating and drinking may be done at a personnel desk in laboratories, provided these desks are not used for any chemical storage or operations.
17. Do not store food in the same refrigerator with chemicals, biohazards, or radioactive materials.
18. When perchloric acid is heated above ambient temperature a perchloric acid fume hood with a wash down system or a local scrubbing or trapping system must be used.
19. Laboratories where hazardous materials or operations are present must follow TVA signage guidelines.
20. An emergency contact list must be posted for each laboratory and updated annually.
21. No smoking in laboratories.
22. All chemical containers must be labeled in accordance with TVA-TSP-18.917, *Hazard Communication.*
23. Chemical spills shall be cleaned up immediately in accordance with spill protocol found on the Safety Data Sheet (SDS).
24. All chemicals shall be disposed of in a manner that ensures compliance with applicable regulations. Consult site environmental personnel to ensure these requirements are met.
25. Business units operating laboratories may choose to implement a Chemical Hygiene Plan in accordance with 29 CFR 1910.1450.
26. Each plant/facility laboratory shall maintain equipment readily available for cleaning up spills. This equipment may include commercially packaged chemical spill kits, absorbents, receptacles, etc.
27. All laboratories should post or have readily available a poison prevention and treatment table.
28. Report any job-related injuries or illnesses to the supervisor and seek treatment immediately.
29. Refrain from the operation of any equipment or instrumentation without proper instruction and authorization.
30. Remain aware of the hazards of the chemicals in the lab and how to handle hazardous chemicals safely.

38.1 Laboratory Safety Equipment and Maintenance Requirements

1. Laboratory equipment shall include:
    a. Fume hood (at least one per laboratory).
    b. At least one permanently installed eyewash station (plumbed to potable water) A pressurized, portable eyewash kit may be used until permanent facilities are installed.
    c. A readily accessible safety shower.
    d. At least one fire extinguisher capable of extinguishing chemical fires.
    e. Fire blanket.
2. Maintain laboratory fume hoods in a neat and orderly manner.
3. Clean up all chemical spills immediately in the prescribed manner.
4. Ensure the face velocity is verified at least annually to be in the required range. The verification must be performed by using an appropriate velometer and by testing in accordance with recognized industry protocols. Sites may choose to repeat commissioning tests to perform this verification. To repeat a commissioning test, a minimum of 25 readings are taken at equidistant points on a standard 10-foot hood. However, less rigorous testing may be used provided it is in line with recognized industry protocol. It is also recommended that face velocity readings be taken in a manner to simulate usage, such as while one is occupying the hood in a normal working condition usually standing near the center of the hood.
5. The face velocity of the fume hood used for non-carcinogenic hazardous chemicals shall be maintained at 80 to 100 linear feet per minute.

6. The face velocity of the fume hood used for carcinogenic/highly toxic materials shall be maintained at 100 to 120 linear feet per minute, not to exceed 125 linear feet per minute.
7. The hoods shall be marked with an arrow indicating the maximum sash height required to maintain optimum face velocity.
8. Notify the responsible supervisor if the performance of the hood decreases significantly but still meets applicable criteria.
9. If the fume hood does not meet the applicable criteria, ensure an immediate evaluation is performed to identify the issue and steps are taken to correct the deficiency before work resumes.

38.2 Corrosive Chemicals

1. Corrosive chemicals include acids and bases.
2. Do not store strong mineral acids (sulfuric, hydrochloric, fluoric, phosphoric, nitric, and glacial acetic acids) near organic chemicals or used near paper, rubber, or wood products.
3. Transport concentrated liquid acids and bases from one storage area to another using plastic containers to minimize spill hazards.
4. Following a transfer of corrosive liquids from one container to another, ensure no chemicals remain on the exterior of the container.
5. For corrosive chemicals with a high vapor pressure such as hydrochloric acid and ammonia, wash exposed skin after handling.

38.3 Organic Solvents

Most organic solvents are high in vapor pressure and should be handled in the fume hood. In addition, many solvents, particularly the non-halogenated ones, are flammable and shall be handled accordingly.

38.4 Reactive Chemicals (Oxidizing Agents)

Oxidizers shall be used with caution as they are corrosive and may cause skin and eye damage.

38.5 Hazardous Material Handling and Storage

1. Use only approved chemicals.
2. When procuring chemicals, procure the minimum amount needed to avoid future issues with disposal. Laboratory staff should be familiar with the rate of chemical use and determine the maximum/minimum amounts to maintain.
3. Ground metal containers and non-conductive containers (e.g., glass or plastic) holding more than five (5) gallons when transferring flammable liquids.
4. Segregate chemicals by hazard classification
5. Do not store incompatible chemicals together. Segregate chemicals by hazard classification. Basic segregation includes:
    e. Oxidizers away from organic
    f. Air/water reactive away from air and water
    g. Caustics away from acids
    h. Cyanides away from acids
6. Store reagent chemicals according to hazardous classifications.
7. Store corrosive chemicals in reagent cabinets especially designed for that purpose.
8. Store acids and bases in separate cabinets to avoid accidental contact.
9. Store reactive, flammable reagent chemicals in cabinets especially designed for these types of chemicals.
10. Store all other concentrated reagent chemicals not requiring the special storage requirements in a central location for ease of control. Diluted reagent solutions should be maintained in the area where the related analyses are performed.

11. Check the integrity of containers. Observe compatibility.
12. Store compressed gas cylinders in well ventilated areas with their protective caps screwed on and the cylinder secured (e.g., strapped or chained down) to reduce the chance of the cylinder being knocked over.
13. Do not store cylinders near heat or high traffic areas.
14. Do not store flammables and oxidizers together.
15. Do not store empty and full cylinders together. Storage of large quantities of cylinders must be done in an approved gas cylinder storage area.
16. Use appropriate hand carts to move cylinders. Cylinders must be secured to the cart during transport. Highly toxic gases should not be moved through the corridors, particularly during business hours.
17. Always consider cylinders as full and handle them with corresponding care.

38.6 Fume Hoods and Other Engineering Controls

1. Fume hoods and other engineering controls such as vented gas cabinets shall be inspected annually with a written report of the results maintained by the supervisor of the lab.
2. New fume hoods should be equipped with airflow monitoring devices, which will alert the user if there is a problem. For older hoods without airflow monitoring devices, ensure flow into fume hoods and other ventilating devices by taping a tissue to the hood and noting the movement when the exhaust fan is turned on.
3. Protective equipment other than fume hoods shall be checked periodically by the laboratory supervisor to ensure that the equipment is functioning properly.

39 Ladders

1. Alternating tread ladders are not covered by this section.
2. All ladders must be maintained in a safe condition.
3. Rungs and steps shall be kept free of grease, oil, ice, and snow.
4. No more than one person shall not a ladder at a time unless the ladder is specifically designed for two-person use.
5. Do not wear dangling jewelry or rings when climbing ladders.
6. Maintain three points of contact while ascending and descending ladders.
7. Inspect ladders for defects such as weakened or broken treads, rungs, cleats or side rails, cracks, corrosion, and other defective or damaged components. Any defective ladder shall be withdrawn from service and a **Danger - Defective Equipment Tag** attached to the ladder.
8. Each employee shall receive the appropriate TVA training course on Ladder Safety before using them.

39.1 Fixed Ladders

1. Fixed ladders that extend more than 24 feet and were installed before November 19, 2018, must be equipped with a cage, approved ladder safety device, or personal fall arrest system.
2. Fixed ladders that extend more than 24 feet and were installed or replaced/repaired after November 19, 2018, must be equipped with an approved ladder safety device or personal fall arrest system.
3. Sites must ensure ladder safety devices, or a personal fall arrest system is installed on all fixed ladders extending more than 24 feet, regardless of the date of installation of the fixed ladder, no later than November 18, 2036.
4. Fixed ladders that have defects or damage sufficient to be unsafe will be identified at all access points until repaired or replaced with a Danger, Defective Equipment Tag.
5. Fixed ladders shall be inspected regularly, with the intervals between inspections being determined by use and exposure. Business Units shall determine inspection frequencies and document accordingly.

6. Alternating tread ladders must be designed, installed, used and maintained in accordance with manufacturer's instructions.

39.2 Portable Ladders

1. All ladders must conform to applicable OSHA standards.
2. All ladders shall have a minimum duty rating of Type IA, industrial, extra heavy duty.
3. All new ladders shall be inspected immediately after purchase.
4. Portable ladders shall be inspected immediately after purchase to ensure that a label identifying the manufacturer, ANSI standard, the type IA designation is attached, and that the ladders were not damaged in shipping.
5. Portable ladders are designed as one-man working ladders including any material supported by the ladders, except for double front self-supporting ladders, which are designed to be used by two workers, one per side.
6. Inspect portable ladders frequently and before each use by or after the ladder has been dropped or otherwise abused.
7. Portable metal ladders shall meet the requirements specified in 29 CFR 1910.26, Portable Metal Ladders.
8. Portable wood ladders shall meet the requirements specified in 29 CFR 1910.25, Portable Wood Ladders.
9. Do not use metal ladders in locations where they may come in contact with electrical conductors. Special work requiring metal ladders in the 500-kV yards must be approved by supervision prior to beginning work.
10. Be sure that a stepladder is fully open, and its spreaders locked before you climb.
11. Set up the ladder on a stable base.
12. Never climb higher than the second step below the top step.
13. Never "walk" a stepladder while standing on it.
14. Never use a stepladder as a single ladder by leaning it against the wall.
15. Do not reach more than an arm's length from a ladder.
16. Do not overload the ladder.
17. Be sure to extend fully and lock platform ladders in place before using them.
18. Check all hardware, nuts, bolts, spreaders, and locks for tightness and good repair.
19. Be sure that your shoes are free of mud or oil so that they will not slip.
20. Shoes shall have heels to prevent slipping when climbing ladders.
21. When ascending or descending, face the ladder and maintain three points of contact. Do not carry tools or materials that will interfere with maintaining three points of contact.
22. Ladders shall not be used by more than one person at a time. An exception is double front self-supporting ladders, which are designed to be used by two workers, one per side.
23. Do not place ladders in front of doors which open toward the ladder unless the door is blocked, locked, or guarded.
24. Do not place ladders on boxes, barrels, or other unstable bases to obtain additional height.
25. Do not splice short ladders together to provide longer sections.
26. Do not use a ladder to gain access to a roof unless the top of the ladder extends at least 3 feet above the point of support.
27. Do not use middle and top sections of sectional ladders for the bottom section unless equipped with safety shoes.
28. Never climb on the bracing on the back legs of stepladders.
29. Fall protection is not required when working from a portable ladder unless a fall potential exists when the ladder is positioned (e.g. adjacent to a loading well). Fall protection shall be used in cases where the ladder exceeds 20 feet, and the employee cannot maintain three points of contactor the ladder is used frequently causing unprotected fall exposure to employees.
30. If ladders tip over, inspect the ladder for side rail dents or bends, or excessively dented rungs; check all rung-to-side-rail connections; check hardware connections; check rivets for shear.

31. Keep ladders clean of any oil, grease, or slippery materials.
32. Lubricate metal bearings of locks, wheels, pulleys, etc., often.
33. Frayed or badly worn rope shall be replaced.
34. Keep safety feet and other auxiliary equipment in good condition.
35. When storing ladders in a horizontal position, ensure supports are in place to prevent sagging and permanent set.
36. Store ladders in a manner that provides ease of access for inspection and does not present hazards to personnel when withdrawing a ladder for use.
37. Store wood ladders in locations where they will not be exposed to the elements, subject to poor ventilation, or near ignition sources.

39.3 Extension Ladders (Wood/Fiberglass/Metal)

1. Extension ladders must be equipped with a pulley of not less than 1-1/4 inches in diameter and with a 5/16-inch synthetic or manila rope designed for the intended use with a safety factor of four (4) or have the minimum breaking strength of 560 pounds. The rope must be of sufficient length for the purpose intended.
2. Extension ladders must be equipped with locks of either the gravity or spring-type capable of sustaining a load of 1,000 pounds. They must be self-releasing and must operate properly.
3. Two pairs of guide irons must be properly positioned and securely fastened to the upper portion of the lower ladder section.
4. Always place the top of the ladder with the two rails supported, unless equipped with a single support attachment.
5. Single ladders shall not be combined for use as extension ladders.
6. To set up a straight or extension ladder at the proper angle, place ensure the base is at a distance from the vertical wall of 1/4th the length of the ladder.
7. Ensure ladders do not slip by either tying the ladder off or having someone hold it in position.
8. Do not use ladders in a horizontal position as platform, runway, or scaffold.
9. Extension ladders shall not be extended when someone is on the ladder.
10. When adjusting the length of an extension ladder, make sure the locking device is fully secured before using the ladder.
11. When using an extension or straight ladder, be sure it is the proper length.
12. To prevent collapse of extension ladders, the minimum overlap of sections is:

Extension Ladder Overlap		
Length of Ladder (feet)	**Two-Section Overlap (feet)**	**Three-Section Overlap (feet)**
≤36	3	6
>36 to ≤48	4	8
>48 to 60	5	10

39.4 Ship's Ladders

1. A ship's ladder is a permanently installed steep pitched stair-like structure with an angle between 50° and 70° with the horizontal, having rigid treads supported by rigid side rails, with handrails on each side. It does not include a ladder configuration made of treads or rungs supported by "side rails" made of fiber or wire rope.
2. Existing ship's ladders will be evaluated against the criteria in this procedure and are required to be changed if the evaluation reveals a condition that could result in serious injury.
3. Handrails with a minimum height of 36 inches above the tread nosing are an adequate engineered control for daily use ship's ladders. When major structural modifications are made to existing

ship's ladders, they shall be replaced with standard industrial stairs unless space/configuration of the area will not permit.

4. For new installations, a ship's ladder shall only be considered for construction where a conventional stairway or other means such as alternating tread stairs cannot be installed because of limited space/configuration. Ships ladders are limited to locations where only occasional use (typical frequency of less than daily) is required, such as for servicing machinery or equipment, access to tanks and similar structures or at conveyor belt crossovers. If a new ship's ladder installation is necessary and will result in hazards specified in item #1 above, then the same additional fall prevention controls are required.
5. In the absence of an OSHA standard, TVA has established the following requirements for the design and construction of ship's ladders:
    a. Design drawings and specifications shall show the necessary information for the fabrication and installation including details on how it is to be secured in place.
    b. Whenever ship's ladders must be constructed outside the construction specifications listed below and/or any applicable regulations at the time of the design, a qualified engineer must design the ship's ladder and it must be constructed according to the design specifications. A copy of the design shall be maintained by the facility/organization. Any deviations to the construction specifications will be listed as well as the reason behind the deviations.
    c. A qualified engineer, as being fabricated and installed in accordance with good engineering practices, shall certify the completed installation.
    d. The minimum design of the tread for any ship's ladder shall be for a concentrated live load of 250 pounds with a safety factor of four.
    e. Ship's ladders shall have a uniform combination of rise and run that will result in a ladder horizontal angle between 50° to 70°. The preferred angle is in the range of 60° to 68°.
    f. Stair treads shall be at least 5 inches in width and spaced not more than 12 inches apart.
    g. Stair width shall be a minimum width of 22 inches.
    h. Ship's ladders shall have flat horizontal treads (as opposed to round rungs).
    i. The optimum height between treads is $8^1/_2$ to 9 inches. Treads shall be open and provided with non-skid surfacing. No risers will be installed. The depth of the tread depends upon the angle of the ladder. As a rule, the rear of each tread shall overlap the front of the tread immediately above. Although portions of the shoe may extend beyond this point, this design will be in contact with the weight-bearing portion of the shoe sole.
    j. Rise height and tread width shall be uniform throughout.
    k. A standard handrail designed to provide an adequate handhold to avoid falling must be provided on both sides of a ship's ladder. The height of the handrail is approximately 36 inches above the tread nosing. Handrails will be capable of supporting a force of at least 200 pounds applied at any point along the top edge of the handrail. The handrail clearance from an adjacent wall or other surface will be a minimum of 3 inches.
    l. New construction of ship's ladders shall have a landing platform provided for each 12 feet of vertical height.
    m. If materials must be transported between levels served by a ship's ladder, material-handling devices (lanyards, cranes, etc.) must be installed.
    n. Vertical clearance above any stair tread to an overhead obstruction shall be at least seven 7 feet.
    o. Ship's ladders will be painted or otherwise treated to resist corrosion and rusting where location demands.
6. Signs will be placed at entrances to ship's ladders containing the following instructions for use:
    a. Face the ship's ladder when ascending or descending.
    b. Keep both hands on the handrails
    c. Do not carry tools or equipment in your hands
7. Only one person on ship's ladder at a time.

8. Always face the ladder and maintain "three points of contact" when using the ladder by keeping both hands on the handrail.
9. If work is required to be performed from a ship's ladder and work location is above 4 feet, then the fall protection requirements will be followed.
10. Never carry tools, equipment, or materials in your hands while ascending or descending a ship's ladder; instead use a tool belt, pouch, holster, or other lifting device (e.g., lanyards located at the ladders to facilitate material handling).
11. Never allow more than one person on a ship's ladder at a time.
12. Always look for obstructions prior to ascending or descending
13. Never place objects in the travel path on ship's ladders.
14. Ensure your footwear does not have mud, oil, etc., on the soles that could contribute to a foot slipping while ascending or descending.
15. Ship's ladders will be inspected annually by the facility where the ship's ladder is installed, and deficiencies corrected. A record of the inspection, findings, and corrective action taken will be made and maintained for a period of three years. Critical deficiencies shall be corrected immediately.
16. The inspection shall include, but not be limited to:
    a. Excessive rust, corrosion, deterioration
    b. Loose or broken anchorage
    c. Damaged steps or railings that no longer support requirements of design
    d. Worn nose, treads
    e. Contaminants on ladder or approach
    f. Adequacy of signage
    g. Functional fall protection devices
    h. Any change to the frequency of use that may demand additional requirements
    i. Any change to the material handling that may demand additional requirements.
    j. Functional material and tool handling devices
    k. Any change to the fall potential

39.5 Ladder Climbing Devices

1. Ladder-climbing safety devices or self-retracting lifelines shall be installed on any fixed ladder that exceeds 20 feet and that does not have a cage. A ladder climbing safety device shall be installed on any fixed ladder that exceeds 30 feet and having a cage but where floor landings have not been installed at least every 30 feet.
2. A warning sign stating, **CAUTION: USE LADDER-CLIMBING SAFETY DEVICE OR SELF-RETRACTING LIFELINE** shall be installed near the access points to the ladder (top and bottom).
3. Use an approved harness with the sliding climbing fixture properly attached to the ladder rail when using a fixed ladder equipped with a ladder-climbing safety device.
4. Ladder-climbing safety devices and self-retracting lifelines used by TVA employees and contractors or used while on TVA property shall be inspected:
    a. Prior to each use for wear, damage or other deterioration in accordance with manufacturers recommendations.
    b. Annually in accordance with Color Coding Inspection of Material and Equipment requirements in this manual. Each inspected device or hardware shall be individually tagged with inspection identification.
5. Inspect harnesses, positioning devices, and integral hardware before use.
6. Defective ladder-climbing safety devices, self-retracting lifelines, or any other defective components shall be removed from service and identified as defective equipment until the device is repaired or replaced.
7. Attachment devices to the ladder shall be fabricated of materials compatible to the ladder.

8. The rail of the ladder-climbing safety device shall extend no more than 36-in. above the top landing or be installed in accordance with manufacturers recommendations if a height discrepancy exists.
9. Clamps and sleeves shall not be able to function in an inverted position.
10. The ladder-climbing safety device or self-retracting lifeline shall be able to arrest a fall while keeping the climber's arms within reach of the ladder.
11. The ladder-climbing safety device or self-retracting lifeline shall allow the climber to rest at any point without using hands.
12. The device must operate in a manner that does not require the climber to operate clamps, sleeves, or other devices while ascending or descending.
13. For galvanized steel rail and stainless-steel rail Saf-T-Climb systems, use both the Shock-Absorbing Y-lanyard and the Saf-T-Climb system, including the sleeve and harness, as directed in the Saf-T-Climb Instruction Manual.
14. Ladder-climbing safety devices or self-retracting lifelines used in a corrosive environment shall be fabricated from corrosive resistant material.
15. All hardware used to secure the harness to the rail shall be stainless steel of drop-forged steel or pressed steel and cadmium plated in accordance with class B plating specified in Federal Specification QQ-P-416C. The surface shall be smooth and free of sharp edges.

40 Lighting

1. As a general rule, lighting should be evenly distributed through the workplace, without deficiencies, so workers can see and move throughout the workplace without eye strain.
2. OSHA provides the following foot-candle minimums for various work activities:
    a. First aid stations, offices and infirmaries - 30 foot-candles
    b. General construction plants and shops - 10 foot-candles
    c. General construction areas - 5 foot-candles
    d. Warehouses, walkways, corridors, exits, and other indoor spaces - 5 foot-candles
    e. General underground work areas, including shafts and tunnels - 5 foot-candles unless drilling, mucking and scaling, then 10 foot-candles are required.
    f. Concrete placement, waste areas, loading platforms, active storage areas, field maintenance areas, refueling areas and excavation sites - 3 foot-candles.

41 Machine Guarding

1. One or more methods of machine guarding shall be provided.
2. Machine guards shall be designed, installed, and used in accordance with requirements in 29 CFR 1910, Subpart O, Applicable Sections.
3. Guards shall be affixed to the machine where possible and secured elsewhere if attachment to the machine is not possible.
4. The guard shall not present a hazard in itself.
5. The point of operation of machines which expose an employee to injury shall be guarded.
6. The guarding device shall be in conformity with any appropriate standards, or, in the absence of specific standards, shall be designed, and constructed as to prevent the operator from having any part of their body in the danger zone during the operating cycle.
7. Special hand tools for placing and removing material shall permit easy handling of material without the operator placing a hand in the danger zone. Such tools are not allowed in lieu of other guarding but can be used to supplement protection provided.
8. The following are examples of machines that require point of operation guarding:
    a. Guillotine cutters
    b. Shears
    c. Alligator shears
    d. Power presses

e. Milling machines
f. Power saws
g. Jointers
h. Portable power tools
i. Forming rolls and calendars

9. Machines designed for a fixed location shall be securely anchored to prevent walking or moving.
10. Bench revolving drums, barrels, and containers shall be guarded by an enclosure, which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.
11. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded, and the guard shall have openings no larger than 0.5-inch.
12. When power operated tools are designed to accommodate guards, the following applies:
    a. The tools shall be equipped with such guards when in use.
    b. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard.
    c. Guarding shall meet the requirements as set forth in ANSI B15.1, Safety Standards for Mechanical Power-Transmission Apparatus.
13. On offhand grinding machines:
    a. Work rests shall be used to support the work and shall be of rigid construction and designed to be adjustable to compensate for wheel wear.
    b. Work rests shall be kept adjusted closely to the wheel with a maximum opening of one-eighth (1/8) inch to prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage.
    c. The work rest shall be securely clamped after each adjustment.
    d. The adjustment shall not be made with the wheel in motion.

42 Material Handling

1. In pre-job briefs, give special consideration to jobs that pose the highest risk ergonomic concerns such as strains and sprains, carpal tunnel syndrome, or other repetitive motion disorders
2. Before gripping an object to make a lift, first consider the weight and dimensions involved.
3. Before making a lift, determine if the object can be lifted safely.
4. Jobs that require an employee to lift an object weighing 50 pounds or more must have a Job Safety Analysis (JSA).
5. Take the necessary action to ensure your safety when lifting items less than 50 pounds.
6. Notify your supervisor if a lift is unsafe and cannot determine a way to make the lift safe.
7. Inspect material for slivers, jagged edges, burrs, and rough or slippery surfaces.
8. Get a firm grip on the object.
9. Keep fingers away from pinch points, especially when setting material down.
10. Keep hands free of oil and grease.
11. Use an observer as a guide when you are unable to see over or around the load.
12. Remove nails or staples from boxes, kegs, or crates before handling material. When removal is not practical, completely bend down the nails or staples.
13. Secure stacked material prior to lifting.
14. When two or more employees are lifting material, designate one to coordinate the lift.
15. Use appropriate personal protective equipment (PPE) when handling hazardous materials.
16. Gloves or other hand protection shall be worn when handling materials.
17. Wipe off greasy, wet, slippery, or dirty objects before you handle them.
18. When handling lumber, pipe, or other long objects, keep your hands away from the ends of the object to prevent them from being pinched.
19. Evaluate size, weight, shape of load, feet, and body position prior to lifting any load manually.

20. Lift with your legs, keep your back straight, ensure firm grip and footing, and maintain adequate control over and around load. Exertion shall be performed while exhaling.
21. Avoid twisting the body when handling material.
22. Straighten your legs to lift the object and, at the same time, swing your back into a vertical position.
23. The Safe Material Handling Checklist in this section as a guide for safe work execution.

42.1 Material Handling with Equipment

1. A Job Safety Analysis is required in these instances:
    a. The weight of the material to be handled is unknown.
    b. The weight of the material to be handled exceeds 90% of the load capacity of the mechanical device used to transport the material.
    c. The material will be transported either up or down an inclined path that exceeds a 10-degree slope.
    d. The material will be transported across floor grating and the total load of the material and material handling equipment is greater than the grating capacity
    e. The material is restrained in the horizontal direction by block and tackle and/or other types of restraints AND it is possible for the forces of the material handling process to exceed the capacity of the attachment point and/or the restraint used to secure the load.
    f. Refer to TVA-TSP-18.006, Plan Jobs Safely for specific requirements related to Job Safety Analysis.
2. Obtain weight and center of gravity of the load by drawings, engineering, or conservative estimating, as appropriate.
3. Understand limits of the equipment and ensure that limits are not exceeded.
4. Use materials handling equipment within its design capabilities and features.
5. Determine and understand the specific requirements for materials handling in specific or local surroundings (environment, site procedures, and unique characteristics).
6. Ensure clear movement path for materials handling equipment. Determine appropriate lifting points for materials that will provide the best stability and not damage the load.

Material Handling Checklist

Safe Material Handling Checklist		
DIRECTIONS: Use the boxes in the last column to document your evaluation. A "no" response may indicate potential problems that require further attention.		**Yes or No**
1	**CAPABILITIES**: Are workers knowledgeable of the proper material handling practices needed to perform this activity safely? Does the weight of the object to be lifted weigh 50 pounds or more? JSAs are required for weights greater than or equal to 50 pounds.	
2	**CONFIGURATION**: Is the object stable? Is the weight evenly distributed? Is the object free from sharp edges and corners? Is the object easy to grasp and hold without slipping? (Handholds are helpful)	
3	**ASSISTANCE**: Can mechanical, wheeled, or motorized devices (hoist, rigging, dolly, hand truck, cart, flatbed, trailer, conveyor, forklift, vehicle) be used? Are others available to help handle heavy, awkward, or numerous objects?	
4	**PERSONAL PROTECTIVE EQUIPMENT (PPE)**: Is PPE available and worn to protect? Examples include proper footwear and appropriate clothing to protect the feed and body and gloves that fit properly and made out of the proper material to protect the hands.	
5	**INTERFERENCE**: Is there enough room to maneuver and stay clear of traffic? Do workers have an unobstructed view of the material handling activity?	
6	**WALKING SURFACE**: Are walking surfaces level, wide enough, clean, clear, and dry? Are floor openings protected or covered, loose grating secured, obstacles such loose or granular material removed, or area cleaned, and slippery substances or oily residues removed or cleaned from the floor/walking surface? Is the load within safe limits for floor or trench grating?	
7	**PLACEMENT**: Are materials being moved the shortest distance possible? Is the work surface adjustable for best handling height? Is the distance between the object and body minimized? Are pushing and pulling forces reduced or eliminated?	
8	**POSITIONING**: Can the material handler AVOID movement above shoulder height, extended reaching with the arms or raising the elbows, static muscle loading (i.e. prolonged grasping or holding tension), sudden movements during handling, twisting at the waist, crouching, or finger pinching grip?	
9	**DURATION and REPETITION**: Are high rates of repetition avoided by job rotation, self-pacing, or sufficient pauses?	
REMINDER: Bend the knees, not the back when lifting or moving an object.		
DO NOT HESITATE TO ASK FOR ASSISTANCE.		
Note: Use of this checklist is optional.		

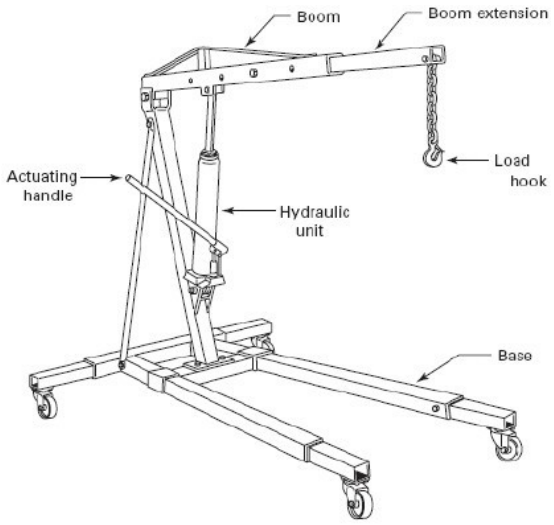
42.2 Material Handling Equipment Inspection

1. Inspect material handling equipment inspection prior to use to ensure the following:
    a. Rated capacity/safe working load is readily visible
    b. No obvious mechanical defects (cracked or distorted parts, bent members, etc.)
    c. Properly inflated tires (as applicable)
    d. No hydraulic leaks (as applicable)
    e. Hooks shall be inspected for cracks, any twist from the plane of the unbent hook, or throat opening is less than 5 percent of new hook dimensions (not to exceed 0.25")
    f. Proper operation of moving parts and load restraint devices (as applicable)
    g. Proper operation of load limiting devices (as applicable).
2. Correct any deficiencies affecting safe operation identified by this inspection prior to use. If the deficiency cannot be corrected immediately, tag the equipment with a Danger Defective Equipment Tag, TVA Form 18004, and remove the equipment from service.

42.3 Hand or Platform Trucks

1. When loading hand trucks, keep your feet clear of the wheels.
2. Do not exceed the manufacturer's load rated capacity.
3. Ensure platform trucks are loaded evenly to prevent tipping.
4. Never attempt to move a load that is difficult to tilt or control and maintain balance.
5. Place the load so that it will not slip, shift, or fall.
6. Use straps to secure the load to the truck, as necessary.
7. Load only to a height which will allow a clear view ahead.
8. Secure the truck from moving when loading or unloading material by use of wheel locks, chocking wheels, having someone hold the truck, etc.
9. Tip the load slightly forward so that the tongue of the hand truck goes under the load as far as possible.
10. Keep the center of gravity of the load as low as possible by placing heavier objects below the lighter objects.
11. When using a hand truck, push the load so that the weight will be carried by the axle and not the handles.
12. Do not walk backward with the hand truck, unless going up stairs or ramps.
13. When going down an incline, keep the truck in front of you.
14. Move trucks at a walking pace only.
15. Let the truck carry the load. Maintain its balance and provide the motive power.
16. Store hand trucks with the tongue under a pallet, shelf, or table.

42.4 Shop Cranes



Shop Crane
Figure 7-1

2. When operating a shop crane:
    a. Understand and follow the manufacturer's instructions before operating this device.
    b. Do not exceed the rated capacity.
    c. Use only on a hard level surface.
    d. Before transporting a load, lower the load to the lowest possible point.
    e. Use only slings or chains with a rated capacity greater than the weight to be lifted.
    f. Do not allow the load to swing or drop violently while lowering or moving.
    g. Do not make alterations without written authorization from the manufacturer.

42.5 Pallet Jacks

1. Only personnel familiar with this device are allowed to use pallet jacks. Prior to initial use, personnel will review the operator's manual and be supervised by an experienced operator until operational skills are demonstrated.
2. Never exceed the manufacturer's load capacity specifications.
3. Start and stop the pallet jack gradually to prevent the load from slipping or shifting.
4. Pull manual pallet jacks when transporting loads horizontally. Push pallet jacks only when going down an incline or passing close to walls or obstacles.
5. Ask a spotter to assist in guiding the load if your view is blocked.
6. Stop the pallet jack if anyone gets in your way.
7. Never place your feet under the pallet jack.
8. Never use a second piece of equipment to push, pull, or lift a pallet jack.
9. Move slowly when making sharp turns to prevent tipping.
10. Keep hands, feet, and other body parts confined to the running lines of the pallet jack.
11. Never ride pallet jacks.
12. Some pallet jacks are capable of carrying 5,000 pounds or more; therefore, extra caution must be taken as it is extremely difficult for one person to stop the pallet jack once in motion.
13. Requirements on the use of and inspection of air pallets will be in accordance with the manufacturer's recommendations. As a minimum, the general guidelines provided for pallet jack use, as provided above, shall be followed when operating air pallets.

42.6 Hilman Rollers

1. Inspect each roller before each use.
2. Select an area that is easily accessible and provides the best load distribution.
3. Ensure that all of the rollers to be used are exactly aligned to ensure minimal friction which could result in shifting of the load.
4. Ensure the roller top is fully supported and kept parallel to the floor.
5. When using large capacity rollers with a machined chain track raceway, ensure the chain roll is positioned properly in the track at dead center of the roller frame.
6. If the object being moved has limited contact area, the roller shall be affixed to the load in at least some temporary manner. This method shall be able to withstand any horizontal force that could result from load shift.
7. When using swivel models with a locking device, lock all rollers before aligning and placing them under the load. The rollers must be aligned parallel.
8. Ensure the load rests upon the entire roller assembly. If a swivel or swivel lock model is used, the load shall cover the entire area of the swivel top plate.
9. Ensure the floor or path upon which the roller transports the load is clean of debris and does not have sharp protrusions.
10. Ensure the floor surface over which the load will be transported is able to support the local concentration that will be generated by each of the rollers.
11. Use steering handles only for steering. Never use them to pull or tow the load.
12. The roller can be towed only when it is permanently affixed to the load.
13. Hilman rollers shall be periodically inspected in accordance with Hilman Maintenance Instructions to ensure all parts are fully functional.

42.7 Proper Materials Handling Practices

1. The weight of an object will determine what sort of equipment will be necessary to safely move the object and considerations that need to be given as to how the object is moved.
2. Do not exceed the capacity of the material handling device.
3. The capacity of the material handling device must be on the device provided by the manufacturer or be added to the device based on manufacturer documentation.
4. Safety of personnel must always be the first consideration when determining how to handle materials.
5. When possible, use equipment like forklifts to reduce risk to personnel.
6. Capacity factors for carts and pallet jacks must be considered.
7. Loads that are top heavy or of awkward shape shall be properly secured.
8. Walk down the entire load path and check for hazards prior to moving materials.
9. Ensure that personnel are clear of the area when the load is in transit.
10. Use extra caution around loading dock drop-offs and inclines.
11. The capacity of the grating must be adequate for material handling equipment and its cargo.
12. Identify pinch points prior to use.
13. Keep hands and feet away from the wheels of platform/hand trucks.
14. Never allow feet to be positioned under pallet jacks.
15. Never operate equipment without all proper guards and covers in place.
16. Never place your body or any extremity where sudden or unexpected movement could create a pinch point.

42.8 Horizontal Material/Equipment Handling

1. Material/Equipment will be moved along a horizontal surface by application of pushing, pulling, or push-pull forces.
2. Forces to move the material/equipment will be applied in a horizontal plane through the use of hoists, hydraulic rams, block and tackle, forklifts, etc.

3. Movement may be aided by the use of rollers, dollies, casters, skids, slides, etc.
4. If any of the following criteria are met, a JSA is required prior to moving the load:
    a. The weight of the load is unknown.
    b. The weight of the material to be handled or force required for movement on a horizontal surface exceeds 90% of the load capacity of the mechanical device(s) used to transport or move the material including all attached slings, rigging hardware, hoists, etc.
    c. The force will be applied by more than one device to move material/equipment on a horizontal surface.
    d. The height of the center of gravity of the material to be handled is greater than either one half of the width or length of the mechanical device used to transport the material.
    e. The material will be transported up or down an incline that exceeds a 10-degree slope.
    f. When transported across floor grating the load imposed on the grating by the mechanical device and load will be greater than the grating capacity.
    g. If restrained in the horizontal direction by block and tackle and/or other types of restraints, the forces imposed on the material handling process will exceed the capacity of the attachment point and/or the restraint used to secure the load.
5. An engineering analysis will be completed for movement of material/equipment along horizontal surfaces when a JSA is required. The analysis must include as a minimum the following:
    a. The force required to move the material/equipment along the horizontal surface considering the weight of the object and the friction between the object being moved and the surface over which it is being moved. This must include the force required to start movement of the object and the force required to maintain movement.
    b. The center of gravity of the material/equipment being moved.
    c. The means by which the required force will be applied and where it will be applied.
    d. Designation of attachment points for rigging that will support the force being applied.
6. Rigging methods, inspections and required size of slings, rigging hardware, hoists, block and tackle, etc., shall be in accordance with the TVA Rigging Manual.
7. When using more than one source to apply the force to move the object, all attachments, rigging, etc., must be sized considering that only one of the sources may be active at any time.
8. A safe travel path must be established. Selection of a safe travel path must include identification of all grade changes and anything that the object being moved could hang on.
9. Changes in the horizontal surface that will increase the friction and changes in grade must be included in the engineering analysis required. In addition, anything along the travel path that the object could hang on must be avoided or eliminated.
10. A load indicator (strain gauge, pressure gauge, etc.) will be used to ensure that the anticipated (calculated) load being applied does not exceed the capacities of components, attachment points, etc., used to move the load.
11. Areas where failure of rigging or force application means could endanger personnel will be identified and means provided to either eliminate or control the hazard prior to movement of the material/equipment. This may require exclusion zones, barriers/guards, restraint for cables or components, etc.
12. Any change in the work methods, equipment, location, personnel, etc., will require a new pre-job briefing with a revised JSA. Occurrence of any of the following requires a new pre-job briefing and a revised JSA. Additional engineering analysis is also required if changes could affect the required forces to be applied.
    a. Change in where force will be applied.
    b. Change in the method of force application.
    c. Impediments to a safe travel path, i.e., obstructions, unanticipated changes in elevation, travel path, surface changes affecting friction, etc.
    d. Changes in the configuration of the equipment/material that could change the center of gravity.
    e. Changes in personnel who were not included in the original pre-job briefing.

42.9 Loading/Unloading Trucks

1. TVA-TSP-18.006, Plan Jobs Safely shall be used to determine whether a JSA is required when loading and unloading trucks.
2. Where material is being loaded or unloaded from flat bed trucks and the material securement method can result in the load falling while the securement is being applied or removed, TVA Form 20366,TVA Material and Unloading Checklist may be used to ensure the task is well planned and any necessary JSA is adequate.
3. The truck must be parked on a level surface and secured against movement, i.e., parking brake, block wheels, etc.
4. Prior to loading/unloading material, the driver, and operator of equipment to be used to load/unload material will inspect the load. The loads must be secured to prevent movement or load falling from the truck prior to removal/attachment of straps or other means used to secure the load during transit.
5. Ensure that no one, other than loading/unloading equipment operators, is allowed within the load drop zone while material is being loaded/unloaded. The load drop zone is defined as the distance from the truck that the load could fall and strike personnel plus 10 feet, but no less than 10 feet.
6. Material that can roll such as pipe requires placement of personnel out of the potential path of a rolling object. Traffic cones will be used to mark the load drop zone.
7. The blind side of the load must remain clear at all times.
8. Loading/unloading will be immediately stopped if the location of the driver cannot be confirmed, or any person enters the load drop zone.
9. A spotter positioned outside of the load drop zone will be used at all times and maintain visual contact with the equipment operator and the load drop zone. The duty of the spotter is to ensure that no one enters the load drop zone and to assist the equipment operator in observing the load.
10. The spotter will have no other assigned duty while material is being loaded/unloaded. The truck driver can act as spotter for the equipment operator. The spotter is not the same as the signal person required when using a crane to load/unload a truck. When a crane is being used, a qualified rigger must act as the signal person for the crane operator, and a spotter would still be used to keep the load drop zone clear of personnel.
11. Loading/unloading equipment, i.e., forklifts, cranes, etc., must be used in accordance with the applicable requirements in the TVA Safety Manual for the equipment being used.
12. When required, equipment operators must be certified on the equipment being operated.

42.10 Dock Loading/Unloading

This section outlines safe steps for unloading box van trailers at loading docks.

1. After truck has backed up to the dock pads, ensure the driver has chocked the wheels of the truck.
2. Use scissor gates or other barriers to prevent foot traffic in the loading/unloading area.
3. Raise the dock locking hitch (if applicable) and connect it to the trailer.
4. Adjust the dock leveler.
5. Ensure all unnecessary personnel, including the driver, are outside the barricaded area.
6. Load or unload the material.
7. Ensure trailer and area is clear of personnel before lowering the dock locking hitch and dock leveler.
8. After the truck has departed, remove any scissor gates or barriers and restore any dock fall protection barriers.

42.11 Loads in Excess of 1000 pounds

1. When moving a load in excess of 1,000 pounds on a wheeled cart:
    a. Complete a Job Safety Analysis (JSA) per TVA-TSP-18.006, Plan Jobs Safely. The JSA shall consider any potential ramps the load may traverse, the stability of the load, the methodology used to move the load; any horizontal restraint systems, the load drop zone should the load tip over or control of the load is lost, and the use of spotters to guide movement.
    b. Assign a First Line Supervisor to oversee the movement of the load. The First Line Supervisor shall verify:
        i. The load will be moved on a platform cart with an adequate load rating (Note: The load rating must be clearly displayed on the cart).
        ii. The wheeled cart is not equipped with pneumatic tires smaller than 12" in diameter (pneumatic tires greater than 12" are acceptable if properly inflated).
        iii. The wheeled cart is equipped with tie down points or can accept tie down attachments, and the load is secured.
        iv. The travel path has been evaluated for the load. Any load weighing in excess of 1,000 pounds moved on a wheeled cart that will travel over floor grating shall have the travel path evaluated by Plant/Site Engineering.
        v. Personnel are not in the load drop zone at any time while the load is being moved. For this application, load drop zone is defined as the area around the load that represents a struck by or caught between hazard if the load tipped over or control of the load was lost. This includes the travel path on inclines at the grade lower than the item being moved (behind the item if ascending and in front of the item when descending).

42.12 Securement of Loads on Wheeled Carts, Light Duty Vehicles and UTVs

1. The requirements in this section are based on the Federal Motor Carrier Safety Administration (FMCSA) requirements. Loads must be secured in accordance with this section regardless of the location they are being used.
2. The load securement requirements in this section apply primarily to wheeled carts, light duty vehicles, and UTVs carrying loads with the potential to fall or fly out. However, for loads moved on other types of material handling equipment or in vehicles other than commercial motor vehicles the same requirements or adequate methods that ensure the load is secure and will not be lost during movement shall be applied.
3. Approved securement device for loads on wheeled carts include:
    a. Ashley Sling Product Number 003000-10200 - standard ratchet type tie down with 1-inch webbing, wire hook, and an 800-pound working load limit.
    b. Ashley Sling product Number 200-10100 - heavy-duty ratchet type tie down with 2-inch webbing, flat hook, and a 3,000-pound working load limit.
    c. Ashley Sling product Number 200-10300 - heavy-duty ratchet type tie down with 4-inch webbing, wire hook, and a 5,000-pound working load limit.
    d. Load Grip Cargo Restraint (Friction) Mats meeting the requirements of the Federal Motor Carrier Safety Administration (Coefficient of Friction greater than 0.8).
    e. Other securement devices may be used with approval of the Rigging Program Coordinator or Site Engineering.
4. Tiedowns and securing devices must not contain knots.
5. Remove damaged tiedowns from service, attach a Defective Equipment tag and return it to the Tool Room or supervisor for disposition.
6. Secure each tiedown in a manner that prevents it from becoming loose, unfastening, opening, or releasing while the wheeled cart is in transit.
7. Use approved edge protection when a tiedown is subject to abrasion or cutting at the point where it touches an article of the load. The edge protection must resist abrasion, cutting and crushing.

8. Use chocks, wedges, a cradle, or other equivalent means to prevent rolling of loads that are likely to roll. The means of preventing rolling must be capable of becoming unintentionally unfastened or loose while the wheeled cart is in transit.
9. Multiple loads on the same wheeled cart placed beside each other and secured by transverse tiedowns must either be placed in direct contact with each other or prevented from shifting towards each other while in transit.
10. Loads placed on a Load Grip Cargo Restraint Mat do not require additional securement devices.
11. Ensure tie downs used to secure equipment and materials are of adequate size and strength to secure the load.
12. The total working load limit of any tiedown securement system used to secure a load or group of loads against movement must be at least one-half times the weight of the load or group of loads being secured.
13. The total working load limit is the sum of:
    a. One-half of the working load limit for each tiedown (see Table below) that goes from an anchor point on the wheeled cart to an attachment point on the load, and
    b. The working load limit for each tiedown (see Table below) that goes from an anchor point on the wheeled cart, through, over, or around the load and then attaches to another anchor point on the wheeled cart.

43 Mowers

1. Do not make modifications to mowers unless approved by the manufacturer. Danger, caution and warning labels shall remain legible and shall not be removed.
2. All positions of the operating controls must be clearly labeled.
3. Wear steel-toed safety boots while mowing.
4. All mowers must have an automatic shutdown device.
5. Do not tamper with the blade while the mower is running.
6. Disable the mower engine before inspecting, adjusting, or changing attachments.
7. Fill the fuel tank outdoors or in well-ventilated areas.
8. Do not fill the fuel tank while the engine is running or while it is still hot.
9. Do not smoke when filling the fuel tank.
10. Use approved and properly labeled Class I safety cans for fuel.
11. Do not transfer fuel from one vessel to another near energized high voltage equipment.
12. Full cover goggles or safety glasses with side shields and proper ear protective equipment shall be worn while operating mowers.
13. Wear gloves when handling mower blades.
14. When making carburetor adjustments, stand to one side and keep hands and feet in the clear.
15. Keep feet away from the blade when starting the mower.
16. On mowers so equipped, do not engage the blade until ready to begin mowing.
17. Always stop the engine when it is necessary to leave the mower.
18. Use skid boards or a hydraulic lift tailgate when loading and unloading the mower.
19. Keep the area of mowing operating clear of unnecessary persons.
20. Keep the mower discharge chute directed away from persons.
21. Mow sloping or uneven terrain horizontally with walking-type mowers if practical.
22. Do not use riding-type mowers on steep terrain greater than 3:1unless specifically designed for the application.
23. Do not use mowers without proper guarding and operating interlock devices in place.
24. Do not use cell phones during the operation of mowers. This includes talking, texting or use of any applications which may be on the phone.

25. Before using the mower:
    a. Read or review the operator's manual to familiarize yourself with the machine.
    b. Learn the location and use of controls, gauges, and dials for the tractor.
    c. Familiarize yourself with speeds, slope capabilities, braking and steering characteristics, and tractor-mower clearances.
    d. Check that the power take off, mower input driveline, drive belts, chains, and gears are all properly guarded. Repair or replace if necessary.
    e. Check the discharge chute to see that it is present and pointed downward.
    f. Fill the fuel tank outdoors with the engine stopped and cool. Do not smoke while filling.
    g. If you will be driving on public roads, be sure the slow-moving vehicle (SMV) emblem is in place. Check that the warning lights are present and operating.
    h. Inspect the work area for debris, ditches, potholes, stumps, irrigation valves, etc. Clear removable items and mark the others.
26. When operating power walk-behind mowers:
    a. Do not tamper with the blade while the mower is running.
    b. Remove the spark plug wire before checking, adjusting, or changing blades.
    c. Fill the gasoline tank outdoors.
    d. Do not fill the gasoline tank while the engine is running or while it is still hot.
    e. Do not smoke while filling the gasoline tank.
    f. Do not stand in front of self-propelled mowers during and after starting.
    g. Inspect the equipment for obvious defects before using. If a defect is found, report it to your supervisor or have it repaired before using the mower.
    h. Clear the area to be mowed of all rocks and debris before starting to mow. Keep the area clear of people and keep the discharge chute directed toward a safe area.
    i. Do not cross graveled areas while the blades are rotating.
    j. Start hand-cranked mowers while standing to one side of the mower and keep feet and hands away from the blade.
    k. Run walk-behind mowers length wise along an incline instead of up and down.
27. When operating riding mowers and tractors, the following rules apply:
    a. Slow down when making sharp turns.
    b. Use seat belts and roll over protection when the tractor/mower is so equipped. Seat belts and rollover protection are required on terrain where a possibility of rollover exists.
    c. Tractor and riding-type mowers shall not be used to mow horizontally on inclines greater than 3:1 (horizontal to vertical), unless they are specially designed for this purpose.
    d. Shut off the engine before dismounting from a tractor and before making adjustments.
    e. Avoid holes and obstacles, such as stones, rocks, or stumps.
    f. Slow down when vision or visibility is limited, or when operating on rough ground.
    g. On highways, abide by the same rules as those for auto drivers. Be sure that the tractor is equipped with a slow-moving vehicle emblem and proper lights before traveling on the highway.
    h. Do not allow any riders.
    i. Disengage power to the sickle bars when they are raised for traveling.
    j. Keep fuel in approved containers (safety cans).
    k. Clear the area to be mowed of all rocks and debris before starting to mow. Keep the area clear of people. If others must be in the area, keep the discharge chute directed away from them.
    l. An approved fire extinguisher shall be attached to the tractor and riding mower in an accessible place.
    m. Opening(s) shall be placed so that grass or debris will not discharge directly toward any part of an operator seated in a normal operator position.
28. When operating a tractor mower:
    a. Be sure your hands and shoes are clean and dry before mounting the tractor to prevent slipping. Use the steps and hand bars.

b. Adjust the seat, fasten the seat belt, set the parking brake, place shift lever in neutral, or park, and disengage the PTO before cranking the engine.
c. Raise the mower high and use low rpm before engaging power to the unit.
d. Use a ground speed based on length and density of material being cut--normally between 2-5 mph.
e. Mow very tall grass twice at 90-degree angles if possible.
f. Mow up and down slopes with rear-mount, pull-type, and wing-type mowers.
g. Mow across slopes with side-mount, offset, and sickle bar mowers.
h. Look behind you before backing.
i. When finished or stopping, disengage the power train operator (PTO), place shift in neutral or park, set parking brake, turn engine off, and wait for all movement to stop before dismounting.
j. Remove the key if leaving the tractor for any length of time.
k. Always block the mower if working under it for any reason.

44 Office Safety

1. Objects on the floor and spilled liquids shall be cleaned up immediately.
2. Materials stored in offices shall be kept in a manner that does not create a hazard.
3. Heavy equipment and files shall be placed on structures that can support the intended load.
4. Office furniture such as tall narrow bookcases and file cabinets that may tip over shall be adequately secured.
5. The following requirements must be met to ensure that file cabinets are stable to prevent tipping when opening drawers:
    a. Cabinets must be equipped with an interlock that prevents more than one drawer being opened at one time.
    b. Cabinets must be secured to prevent tipping by either:
    c. Ganged with adjacent file cabinets and secured together
    d. Equipped with an optional counterweight package, or
    e. Bolted to the floor or wall
6. Cabinets must be loaded from the bottom drawer up. The heaviest contents must be loaded in the bottom drawers.
7. Only one file drawer in any file cabinet shall be opened at a time, and the drawers shall be kept closed when not in use.
8. Office furniture shall not be used as a substitute for ladders or step stools.
9. Office furniture shall not have any rough edges, burrs, sharp corners, etc.
10. Floor finishes shall be selected for anti-slip qualities. The wax used on floors shall also be selected based on its anti-slip qualities.
11. Use only approved (rubber-backed or other non-slip backing) throw rugs.
12. Aisles, corridors, and means of egress shall remain unobstructed throughout the work area. Interior aisles shall have a minimum width of 36-inches.
13. Report loose tiles, broken steps or railings immediately to the responsible facilities organization.
14. Use only step stools or ladders for climbing.
15. When charging batteries in an office setting, follow the manufacturer recommendations to ensure batteries are charged in an appropriate location and the recommended charging time is not exceeded.

44.1 Electrical Equipment and Office Machines

1. All office machines shall be Underwriter Laboratories (UL) listed and be provided with a grounded service cord or double insulated.
2. Do not connect multiple outlet extension cords into other multiple outlet extension cords.

3. Immediately unplug any electrical device that smokes, sparks, or delivers an electrical shock and report to the responsible repair personnel.
4. Avoid running electrical cables and cords in a way that may create a tripping hazard or may be damaged by traffic.
5. Coffee making appliances shall be grounded, UL listed, and placed on a noncombustible surface that is at least 3-feet from unprotected combustible material.
6. Portable electrical heaters shall not be placed near flammable or combustible material.
7. Portable electrical heaters shall be provided with an automatic power cut-off switch that will activate when the heater is tipped over.
8. Portable fans shall not be plugged into electrical receptacles while making adjustments or moving the fan to other locations. Portable fans shall be guarded with no opening in the guard greater than 1/2 inch.
9. Defective electrical cords or defective electrical equipment shall not be used.

44.2 Office Tools

1. Sharp edges on tools such as Exacto knives shall be guarded.
2. When using Exacto knives, the cutting action shall be away from the body.
3. Waste receptacles appropriate for the work environment shall be provided.
4. The blades of hand-operated paper cutters shall be kept in the down position and locked when not in use. Guards for paper cutters shall be kept in place at all times.

45 Painting

1. Select spray-painting equipment so that hose and gun pressure ratings correspond to air pressure used.
2. Never point the spray gun at yourself or anyone else or place the tip or nozzle in direct contact with any part of the body.
3. Always tighten threaded connections carefully and securely and handle the hose with care.
4. Decrease air pressure when using high-vapor and high-mist concentrations to reduce overspray.
5. Follow the Safety Data Sheet instructions for all painting or mixing of paint.
6. When applying greater than 1-quart of high Volatile Organic Compound (VOC) coatings in an enclosed/interior space, painters shall establish a ventilation plan that shall be approved by a Maintenance Manager, Maintenance Support Manager, or Buildings and Grounds Manager. Contact a TVA Safety professional if guidance is needed.
7. Do not smoke or use any flame producing device where any flammable or combustible paint is being applied.
8. When using drop cloths, ensure that floor openings are not covered, creating a falling or tripping hazard.
9. Do not place drop cloths overheat-generating equipment, i.e., lights or heaters that may automatically operate.
10. Do not dispose of aerosol containers in a fire.
11. Store all paint properly in accordance with the instructions on the Safety Data Sheet.
12. Properly label and store materials such as rags and drop cloths that are saturated with oil-based paint in UL Listed, non-combustible waste rag containers out of the sun. All containers shall be emptied daily with the contents being removed from the building.
13. Before eating, drinking, or smoking, wash/clean your hands and face.
14. Do not go near open flames while wearing clothing contaminated with paint or thinner.
15. Keep an appropriate Class B fire extinguisher available (within 50-ft) when using paints.
16. Vapors associated with painting can pose a significant threat to off-gas treatment charcoal trays or any ventilation system with charcoal trays. Check with responsible operations personnel before beginning a job in which this condition could be created.

17. Wear the proper PPE. Where respiratory protection is required, select the proper respirator for the contaminants. Reference the SDS for PPE requirements.
18. Paint shall be stored away from direct sun heating.
19. Paint shall be kept away from heat and open flames.
20. Paint containers, when not in use, shall be closed.

46 Personal Protective Equipment

46.1 Hazard Assessments/Exemptions

1. Sites shall perform assessments to determine sources of hazards that require Personal Protective Equipment (PPE).
2. These assessments are performed in accordance with the criteria listed in TVA-SPP-18.001, Safety Programs.
3. These assessments are documented using TVA Form 20832, Workplace Hazard Assessment.
4. Where exceptions must be for special circumstances, such as wearing PPE creating a greater hazard to employees than the identified hazard, TVA Form 20883, Personal Protective Equipment Exception Form shall be used to document the exception and retained with the pre-job brief.
5. Exceptions for fall protection and arc flash protection not allowed.
6. The exceptions shall be discussed in the pre-job brief along with other measures needed to protect employees from the hazard.

46.2 Clothing

1. Consider hazards of the use of protective clothing to personnel, such as heat stress, physical and psychological stress, impaired vision, mobility, and communication.
2. No single combination of protective equipment and clothing is capable of protecting against all hazards. Use protective clothing and equipment with engineering or administrative controls.
3. Firefighter turnout clothing, proximity gear, blast suits, and radiation suits, by themselves, may not be adequate protection from hazardous chemicals.
4. Nomex coveralls, natural fiber or other suitable flame-resistant garments shall be worn inside chemical protective suits when exposure to a flash fire is a concern.
5. When selecting protective clothing, evaluate the clothing to necessary protection levels.
6. Protective clothing physical properties such as flexibility; resistance to tears, cuts, punctures; and resistance to heat or cold must be compared with the tasks being performed. Additional or different protective clothing may be required.
7. In many cases, simple protective clothing by itself may be sufficient to prevent chemical exposure, such as wearing gloves in combination with a splash apron and face shield.
8. Factors to consider when selecting protective clothing include:
    a. Chemicals hazards such as toxicity, corrosiveness, flammability, reactivity, and oxygen deficiency.
    b. The physical environment such as hot, cold, rugged, confined spaces, heavy lifting, and climbing.
    c. The chemical exposure time versus chemical breakthrough of clothing.
    d. Selection and availability of protective clothing.
9. Periodically, re-evaluate protective clothing use and level of protection as the amount of information about the chemical or process increases and when workers are required to perform different tasks.
10. For chemical protective clothing, wear protective clothing whenever potential exposure to chemical hazards exists. Equipment and clothing shall be selected that provides an adequate level of protection. Over protection, as well as under protection, can create additional hazards and shall be avoided.

11. The degree of difficulty in decontaminating protective clothing may dictate whether clothing will be disposable (one time use), reusable (multiple times wearing), or a combination of both.
12. When decontaminating protective clothing, establish protocol that minimizes contact (e.g., time exposed, concentration) with chemicals.
13. If the chemical protective suit and accessories were not cleaned following decontamination, perform the following in accordance with the manufacturer's requirements.
    a. Wash down the suit with a solution of low sudsing powered detergent and warm to moderately hot water to cleanse the inside and outside of the suit.
    b. Rinse suit thoroughly with warm to moderately hot water.
    c. Hang to dry at room temperature to permit airflow through suit.
    d. Do not use chemical protective suits or accessories that have not been thoroughly cleaned and dried.
14. There are five times when chemical protective clothing must be inspected:
    a. Inspection and operational testing of equipment received as new from the factory or distributor.
    b. Inspection of equipment when selected for use.
    c. Inspection of equipment after use and prior to maintenance.
    d. Periodic inspection of stored equipment.
    e. Periodic inspection when a question arises concerning the appropriateness of selected equipment, or when problems with similar equipment are discovered.
15. Follow manufacturer's instructions or inspection checklist when inspecting or testing.
16. Ensure inspection and testing of fully encapsulated suits is documented. TVA Form 20842, Inspection and Air Pressure Test Log for Fully Encapsulated Suits, may be used for documentation.
17. If the suit is being tested after use, decontaminate and clean it prior to testing.
18. Air pressure tests shall be conducted in compliance with ASTM F1052.
19. Use the manufacturer's suit specific air pressure testing kit to perform testing and perform all testing in accordance with manufacturer specifications.
20. Store protective clothing in a manner that prevents damage or malfunction from exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures (not to exceed 120° F) and impact.
21. Store boots in a clean, dry location. Do not lay boots on their side or stack materials on the boots.
22. Ensure the suit is completely dry before storing.
23. Store suits lying flat, in a protective container, if feasible. If not feasible, store suits in the original carry bag or on a hanger.
24. Store suits with the zipper open to permit air circulation.
25. Do not force the material, seams, or zipper when folding the suit. Off-set folds each time the suit is returned to storage to prevent permanent creasing.

46.3 Eye Protection

1. Defective safety glasses shall be replaced without cost to the employee upon return of the defective or damaged safety glasses.
2. Facilities that do not have general area requirements shall identify and post areas where eye protection is required.
3. Use appropriate eye protection for the facility and follow the requirements for posted areas. For power plants:
    a. Wear approved safety eyewear in the powerhouse, warehouses, shops, coal handling, and construction areas or any areas that are posted as eye protection required.
    b. Control rooms, offices, computer rooms, training rooms, lunch areas, assembly and meeting areas, parking areas, shower and locker rooms, bathrooms, and similar occupancies are not subject to the eye protection requirements unless otherwise posted.

4. Wear the appropriate eye or face protection when exposed to machinery or operations that have potential for eye or face injury or when exposed to hazards from flying particles, dust, molten metal, liquid chemicals, chemical gases or vapors or potentially injurious light radiation. When using hazardous substances or chemicals, refer to the Safety Data Sheet (SDS) to ensure the eye protection is adequate. Reference the Eye Protection Selection Guide in this section as a reference for selecting the correct eye and face protection. Where exposures are severe, additional requirements other than those listed in the chart may be required. For example, severe exposures may require foam flanged safety glasses or spoggles in addition to a faceshield. Questions should be directed to your supervisor.
5. Where a faceshield with goggles is required, products such as the Pyramex Capstone Shield that are one piece and contain both the faceshield and the goggle are permitted provided the faceshield provides the protection necessary for exposure.
6. Do not wear eyewear with exposed metal parts when working within arms length or the Minimum Approach Distances specified in this manual.
7. Employees who wear prescription lenses and are exposed to eye hazards must wear prescription lenses that meet the requirements of safety glasses or eye protection that can be worn over prescription lenses.
8. Never alter or modify eye and face protection equipment and wear eye and face protection in accordance with the manufacturer's requirements.
9. Inspect eye and face protection before use and ensure both are clean and in good repair.
10. When performing tasks that could result in eye hazards in another area, take measures such as warning signs and barricades to warn others of hazards and requirements. This includes welding activities where the welding flash poses a hazard.
11. When performing tasks that create the potential for flying particles, objects or splashed hazardous liquids, wear a face shield over safety glasses with side shields, monogoggles or spoggles.
12. Do not use eye protection with darkly tinted lenses indoors except for activities that emit harmful light rays such as welding. Where lenses may have a light tint, they are permitted as long as the shade of the tint does not have the potential to interfere with hazard identification. For example, light blue and light yellow tinted lenses are permissible provided the tint does not have the potential to interfere with hazard identification. This restriction against tinted lenses may be waived for personnel having verifiable medical restrictions. Photo gray lenses are permitted provided they return to clear.
13. Use the Filter Lenses for Protection against Radiant Energy Table in this section for selecting the correct shade number for protecting the eyes from injurious light.
14. Non-prescription and prescription safety glasses, goggles, and face shields shall comply with ANSI/ISEA Z87.1, American National Standard for Occupational and Educational Personal Eye and Face Protection Devices. Lens material must be made of polycarbonate as a minimum. All safety markings for ANSI/ISEA Z87.1 safety eyewear must be permanently and clearly marked on the frame or lens. This marking requirement includes goggles and face shields as well as safety glasses.
15. The manufacturer's emblem and a "+" must be on the lens to designate "High Impact" lens on all glasses purchased after October 7, 2013 (prescription high impact lens will not have Z87 stamped on them).
16. If you have any questions/problems with eye protection, stop and contact your supervisor.

k.

Eye Protection Selection Guide		
Operations	**Hazards**	**Required Protection**
Acetylene - burning, cutting, welding	Sparks, harmful rays, molten metal, flying particles	Welding goggles or safety glasses with side shields and welding helmet with appropriate lens
Chemical handling, cryogenic liquids and other hazardous liquids	Splash, acid burns, flying particles	Chemical goggles, face shield or other protection that meets the requirements listed in the SDS
Chipping	Flying particles	Faceshield with safety glasses, monogoggles or spoggles
Electric (arc) welding	Sparks, intense rays, molten metal	Welding helmet w/ required lenses and safety glasses with side shields
Energized electrical	Electric arc flash, burns	Special tinted face shield over safety glasses (minimum 8 cal/cm²)
Grass cutting	Flying objects	Standard goggles or safety glasses with side shields
Grinding and disc cutting	Flying particles	Faceshield over standard goggles or safety glasses with side shields
Machining	Flying particles	Standard goggles or safety glasses with side shields
Portable Power	Flying particles	Standard goggles or safety glasses with side shields
Soldering	Molten metal	Standard goggles or safety glasses with side shields
Cleaning with air	Flying particles	Standard goggles
Use of hammers and/or impact tools	Flying particles	Safety glasses with side shields
Wire and metal band cutting	Flying objects	Safety glasses with side shields

Filter Lenses for Protection during Shielded Metal Arc Welding				
Operation	**Electrode Size inch (mm)**	**Arc Current (Amperes)**	**OSHA Minimum Protective Shade Number**	**ANSI & AWS Shade Number Recommendations**
Shielded Metal Arc Welding (SMAW)	< 3/32 (2.4)	<60	7	-
	≥3/32 (2.4) to ≤5/32 (4.0)	≥60 to ≤160	8	10
	>5/32 (4.0) to ≤1/4 (6.4)	>160 to ≤250	10	12
	> 1/4 (6.4)	>250 to ≤550	11	14

Filter Lenses for Gas Welding and Oxygen Cutting Operation				
Operation	**Plate Thickness (inches)**	**Plate Thickness (mm)**	**OSHA Minimum Protective Shade Number**	**ANSI & AWS Shade Number Recommendations**
Gas Welding	<1/8	<3.2	4	5
	≥1/4 to ≤1/2	≥3.2 to ≤12.7	5	6
	>1/2	>12.7	6	8
Oxygen Cutting	<1	<25	3	4
	≥1 to ≤6	≥25 to ≤150	4	5
	>6	>150	5	6

Filter Lenses for Protection during Other Welding and Cutting Operations			
Operation	**Arc Current (Amperes)**	**OSHA Minimum Protective Shade Number**	**ANSI & AWS Shade Number Recommendations**
Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW)	<60	7	n/a
	≥60 to ≤160	10	11
	>160 to ≤250	10	12
	>250 to ≤500	10	14
Gas Tungsten Arc Welding	<50	8	10
	≥50 to ≤150	8	12
	>150 to ≤500	10	14
Air Carbon Arc Cutting Light	<500	10	12
Air Carbon Arc Cutting Heavy	≥500 to ≤1000	11	14
Plasma Arc Welding (PAW)	<20	6	6-8
	≥20 to ≤100	8	10
	>100 to ≤400	10	12
	>400 to ≤800	11	14
Plasma Arc Cutting Light	<300	8	9
Plasma Arc Cutting Medium	≥300 to ≤400	9	12
Plasma Arc Cutting Heavy	>400 to ≤800	10	14
Torch Brazing	n/a	3	3 or 4
Torch Soldering	n/a	2	2
Carbon Arc Welding (CAW)	n/a	14	14
As a rule of thumb, start with a shade that is too dark to see the weld zone. Then, go to a lighter shade which gives a sufficient view of the weld zone without going below the minimum. During oxygen gas welding or cutting where the torch produces a high yellow light, it is best to use a filter lens that absorbs the yellow or sodium line in the visible light (spectrum) of the operation.			
Values apply where the actual arc is clearly seen. Lighter filters may be used when the arc is hidden by the work piece.			

46.3.1 Prescription Safety Glasses

1. Employees who must wear prescription eyewear and who are assigned a job that requires the wearing of full-face respirators, breathing apparatus, or other full-face masks are provided a special metal spectacle kit designed for the particular respirator and clear 44-millimeter corrective lenses.
2. Employees with vision requiring the use of corrective lenses, and who are required to wear eye protection, shall be protected by goggles or spectacles of one of the following types:
3. Spectacles with protective lenses that provide optical correction.
4. Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.
5. Goggles that incorporate corrective lenses mounted behind the protective lenses.
6. Prescription safety frames that meet the High Impact Standard are to be marked Z87-2 or Z87+. Prescription safety lenses must have the "+" next to the manufacturing lab's monogram.
7. Visitors, contractors, and new employees who do not have prescription safety glasses with side shields shall wear standard goggles or visitors' spectacles over their prescription eyewear.
8. For information and instructions on acquiring prescription eyewear, go to the Safety SharePoint site and click the Employee Health Link.

46.4 Flotation Devices

46.4.1 Personal Flotation Devices (PFDs) (Lifejacket)

1. All PFDs shall have a unique identifier such as a number.
2. Use a PFD that is the proper size and fit and will support your approximate weight, including any attached equipment and an allowance for wet or water filled clothing.
3. Wear PFDs when a danger of drowning exists and there are no guardrails or fall protection to prevent a fall into the water. When boating, wear PFDs at all times the boat is in the water (See the boating section of this manual).
4. All PFDs must be Coast Guard Approved.
5. High visibility colors such as international orange are preferred.
6. Use of buoyant cushions as PFDs is not allowed.
7. Use of recreational PFDs is not allowed.

46.4.2 Work Vests

1. If performing deckhand work or working from a tug, wear a U.S. Coast Guard approved work vest with reflective material at all times
2. While working in the wheelhouse, pilots are not required to wear a personal flotation device.
3. Type III, U.S. Coast Guard approved work vest with Type 1 reflective material shall be readily available for immediate use by marine operation pilots and other employees on board a vessel.
4. Type I, U.S. Coast Guard approved work vests with Type 1 reflective material shall be readily available for immediate use by an authorized passenger.

46.4.3 Ring Buoys

1. When frequent work assignments are performed on pipelines, walkways, piers, bulkhead, scaffolds, platforms, and similar structures extending over or immediately adjacent to water, one ring buoy and line with additional buoys shall be provided at intervals of not more than 200 feet.
2. For non-frequent work tasks at the above locations, a ring buoy(s) shall be carried to the work location. These requirements are applicable to both guarded and non-guarded work areas.
3. A minimum of one ring buoy shall be provided in all motorboats 16 to 40 feet in length and two ring buoys for motorboats 40 feet or over in length.
4. Ring buoys shall meet the requirements of 46 CFR 160.050, have an outside diameter of 24 inches and shall be international orange in color.
5. Each ring buoy shall have a minimum of 90 feet of 3/8-inch diameter synthetic line attached. Each length of line shall have a minimum breaking strength of 1,500 pounds.

46.4.4 Skiffs

1. Provide one or more lifesaving skiffs at locations where employees are working over or immediately adjacent to water when wearing flotation or body harness and lifeline devices. Skiffs are not required when working around nuclear fuel pools and/or reactor cavity or ash ponds.
2. Each lifesaving skiff shall be equipped with the following:
    l. Two oars
    m. Oarlocks securely attached to gunwales or the oars,
    n. One blunt/ball-pointed retrieval hook,
    o. One ring buoy, and
    p. Two work vests.
3. Lifesaving skiffs shall have a minimum capacity of 800 pounds; flotation tanks or buoyant material capable of floating the boat, its equipment, and three adults; and the equipment.
4. In locations where the water is rough, swift, or where manually operated lifesaving skiffs are not practical, a powered boat is required.

46.4.5 Inspection and Maintenance of Flotation Devices

1. Inspect flotation devices before use.
2. Document the inspection on a pre-job brief, two-minute rule card, work order or other appropriate work record.
3. Remove, destroy and replace any device found to have defective that alters the strength or buoyance or that shows significant signs of wear.
4. Document formal inspection of PFDs on TVA Form 17723, PFD Inspection Log. This log shall be kept on file with the responsible supervisor.

46.5 Head Protection

46.5.1 Hard Hat Safe Work Requirements

1. Wear hard hats in work areas or when performing tasks when there are known hazards that may cause a head injury or where areas are posted requiring hard hats use.
2. Facilities that do not have general use requirements shall post work areas where hard hat use is required with the appropriate signage.
3. Inspect hats before use. Examine for cracks, brittleness, discoloration, or chalky appearance. Check the suspension for wear, cracks, breaks, or frayed straps. Examine for signs of exposure to heat, chemicals, ultraviolet light, or other radiation. Discard defective or damaged hats from service.
4. Wear the integral suspension in hard hats at all times.
5. Wear the hard hat centered on the head, not tilted to the front or back. Ensure the hat fits securely on the head with the headband adjusted to a snug fit.
6. Never modify or alter a hard hat.
7. Never drill holes through the protective shell of a hard hat.
8. Wear hard hats with the cap brim to the front. Reversed hard hats designed with reversible suspension are only for use by those who frequently attach manufacturer supplied protective devices such as welding helmets and face shields. Reversed hats may also be worn when the brim interferes with the proper fit of a full-face respirator or face mask.
9. Never apply paint to hard hats.
10. Stickers, decals or marking on hard hats is limited to: Employee name, employee's organization identification, TVA or Business Unit logo, safety related decals and stickers, and special recognition or marking approved by the facility manager or designee.
11. Never wear anything underneath a hard hat unless the item is specifically designed for use, such as winter liners, welders' caps, contamination zone caps and canvas hoods. Baseball caps and other similar caps are prohibited.

46.5.2 Hard Hat Equipment Requirements

1. Hard hats shall be Class E and comply with ANSI/ISEA Z89-1, American National Standard for Industrial Head Protection. At a minimum, suspensions shall be replaced annually, and hard hats shall be replaced within 5 years of being placed in service.
2. Hard hats must be constructed of approved plastic, polycarbonate, or polyethylene materials. Skull Guard resin hats, carbon fiber or other conductive materials are not permitted.
3. Bump caps are not approved for use at TVA as they do not meet ANSI Z89-1 requirements.
4. Low profile helmets are allowed for work in tight quarters where traditional hard hats are not feasible and a hazard to the head exists. These low-profile helmets must be Class E and meet ANSI Z89.1 requirements. Petzl Industrial helmets meet these requirements.
5. The use of helmets such as Pro-Tech Polyethylene Shell Military Helmets are acceptable for use by Security Personnel during drills, exercises and actual response.

46.6 Hand and Arm Protection

46.6.1 General Requirements for Hand and Arm Protection

1. Always wear approved gloves when performing work that involves a potential for hand injuries. Examples of these work activities include but are not limited to working with sharp objects/ edges, material handling, chemical use, fabrication, climbing ladders/scaffolds, manipulating valves and other maintenance and operational activities.
2. All general-purpose gloves purchased and issued by TVA must have a minimum ANSI/ISEA 105, American National Standard for Hand Protection Classification, cut level rating of 2. This does not include specialty gloves made for certain types of work. Contractors may provide gloves of their choice as long as the minimum cut resistance rating for the task is met. A list of hand and arm protection approved for purchase by TVA is found in the Approved Hand and Arm Protection Table in this section.
3. Use work planning, the pre-job brief, the two minute rule, and other applicable information to evaluate the work activity and identify the hazards. Select the hand protection appropriate for the task. The Selection of Suitable Hand Protection table in this section provides basic information to assist in selection of proper hand protection.
4. When handling chemicals or being exposed to chemical hazards, reference the Safety Data Sheet (SDS) to determine the proper hand protection. For chemical mixtures or formulated
    q. products, use the glove based on the chemical component with the shortest break through time.
5. Inspect gloves before use and wear gloves that properly fit.
6. Use Kevlar sleeves as forearm protection where potential exists for cuts, lacerations, or abrasion injuries to the forearm.
7. When working near rotating or moving machinery or with rotating or moving tools and equipment such as belt sanders and grinders, do not wear gloves that could create an entanglement hazard. Gloves are generally required when using tools or equipment that pose a cut abrasion hazard to the hands. However, in certain cases, manufacturer instructions may require that no gloves be worn because of an entanglement hazard. The user must ensure that when using/selecting gloves an additional hazard is not created. If in doubt, reference the manufacturer instructions or contact a site or regional safety professional.
8. In Nuclear Power Plants:
    a. Employees shall have work gloves on their person when in station or industrial areas or as posted.
    b. When traveling to and from designated anti-contamination protective clothing dress out areas, gloves are not required to be carried provided no work is to be performed prior to entering contaminated areas. Additionally, after exiting a contaminated area and transiting to the exit of the radiologically controlled area, gloves are not required to be carried if no work is to be performed prior to exit.

c. Appropriate cut level hand and arm protection is required in addition to anti-contamination gloves when performing work in a contaminated area that involves potential for injury to the hands.

46.6.2 Hand Protection for Electrical Work

1. Inspect gloves before use. Inspect for damage before each use and immediately following any incident that can reasonably be expected to cause damage. Perform an air test. If any defects are found in an electrical glove, remove the glove(s) from service.
2. Follow manufacturer's guidelines for care and use of gloves.
3. When working on energized electrical equipment, use only electrical rubber gloves that have been tested and approved by a testing facility in the previous 6 months.
4. Use gloves that are appropriate for the voltage hazard. Electrical gloves shall be clearly marked on cuff portion of gloves with glove class and electrical voltage.
5. Clean insulating gloves before use to remove foreign substances.
6. Store insulating gloves in a location and manner that protects the gloves from light, temperature extremes, excessive humidity, ozone, and other adverse conditions.
7. Wear protective gloves over insulating gloves. When working with Class 00 and Class 0 gloves, under limited-use conditions and where small equipment and parts manipulation necessitate high finger dexterity, protector gloves may be removed. When protector gloves are not used, use extra caution in examining the glove for defects and avoiding exposure to sharp objects.

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Approved Hand and Arm Protection Table		
Cut Rating	**Glove**	**Cat ID**
A2	34-8743, Maxi flex seamless knit with Nitrile coating - Dyneema	CYA639K (x-small); CYA657H (small); CXR133D (medium); CXT217D (large); CXT219X (x-large); CXR134B (XX large); CXN226M (XXX large)
A2	09-K3750 Maxiumum safety ARC rated 28.5 cal, Kevlar lines Goatskin drivers' glove	CMY966L (small); CMY210Q (medium); CMY211B (large); CMY217Y (x-large); CMY218W (XX-large); CNB775P (XXX large)
A2	09-K1660 G-Tek CRA Knit Kevlar with Nitrile Coated grip	CPC944F (small); CPC951J (medium); CPC952G (large); CPC953E (x-large); CPC954C (XX large)
A2	56-633 MaxiChem Cut Nitrile Blend Coated with HPPE liner and non-slip grip	CXT063R (small); CXT064P (medium); CXT065M (large); CXT066K (x-large); CXT067H (XX-large); CNB775P (XXX large)
A2	Ironclad Wrenchworx AGT GUG Mechanic	CVC802C (x-small); CRH479A (small); CKH781G (medium); CKH783C (large); CKH784A 9X-large); CRH480A (xx large)
A2	HW4 Ironclad Heatworx Reinforced, Kevlar Inner Liner and heat resistance for low to medium heat	Unknown
A3	44-3745 MaxiCut Ultra by ATG. Micro foam Nitrile Coating - Dyneema	CXB838E (small); CXB840J (medium); CXB841R (large); CXB842P (x-large); CXB843M (XX-large)
A6	320 CR Black Stallion Cut Resistant, Side Split, Para-Aramid Cut Resistant Liner	Unknown
A7	09-K1600 G-Tec seamless knit with Nitrile coated foam Grip - 13 gauge	CYE185C (small); CXE187K (medium); CXE188H (large); CXE189F (x-large); CYE190Y (XX-large)
A5 (sleeve)	10-KA18TO Kut guard Single ply Kevlar sleeve	CYE222C

Selection of Suitable Hand Protection		
Operation	**Hazard**	**Hand Protection**
Work with batteries, battery changing	Chemical splash, acid burns	butyl rubber acid resistant gloves
Biological hazards	Basic cleaning activities, medical activities	Latex or vinyl non permeable glove
Chemical exposure (pouring, mixing, cleaning, handling chemicals, painting, etc.)	Any activity where the chemical may come in contact with the hand	Reference Safety Data Sheet for appropriate, adequate hand protection
Cold/freezing work processes	Liquid CO2 unloading, freeze seal activities	Cryogenics glove, leather glove if it provides needed protection
Working with knives/ tools with sharp blades, handling glass, handling materials with sharp edges, changing light bulbs	Cuts/Lacerations	Cut resistant level 3 gloves
Sheet metal handling/fabrication, splicing cable, repairing safety grounds, cutting band straps	Cuts/Lacerations	Cut resistant level 3 gloves AND Kevlar forearm protection
Welding, torch cutting, hot work operations, work on high temperature systems.	Burns, molten metal	Welders' gloves, heavy duty gauntlets
Working on energized or potentially energized equipment	Shock	Voltage rated gloves of appropriate class for the work
Working with hot objects, surfaces greater than 130 degrees F	Burns	Leather gloves, welders' gauntlet, or high temperature insulated gloves (ensure glove has adequate temperature rating for exposure)
Heavy construction, handling wood crates, pallets, etc.	Puncture	Cut resistant ANSI level 2 gloves
Portable hand grinder use, cleaning metal sharps from machinery, heavy metal work and other tasks where razor sharp edges and high force is applied	Cuts/Lacerations	Cut resistant ANSI level 7 gloves AND Kevlar sleeves
Handheld tools, handling scaffolding, general material handling, manual valve operation, general operations and maintenance activities	Cuts, abrasions, punctures	Cut resistant ANSI level 2 gloves
Arc based tasks	Exposure to arc flash hazards	Gloves appropriate for the arc flash potential as defined in TVA-TSP-18.1022
Slurry line maintenance, ash pulling	Burns	High temperature insulated gloves with adequate temperature rating for exposure

46.7 Hearing Protection

1. TVA's full Hearing Conservation program is found in TVA-TSP-18.908, Hearing Conservation.
2. Inspect your hearing protection regularly. Ensure that it is clean and fits properly.
3. Any issues regarding the use of hearing protection shall be reported to your supervisor immediately.
4. TVA shall provide a variety of suitable hearing protectors from which employees may choose.
5. Wear hearing protection in all posted areas and where mandated by business units or sites.
6. Earplugs are the "primary" hearing protector used at TVA. Muffs are typically used as part of double protection.
7. If hearing aid(s) usage, cochlear implants or other condition(s) warrant the need for muffs as the "primary" hearing protector, then they must be approved on a case-by-case basis with concurrence of TVA Safety and the TVA Audiologist. Special requirements may apply, and provisions will be made and communicated to the individual, their Supervisor and Manager.
8. Earplugs with a Noise Reduction Rating (NRR) of 28 or greater are required.
9. Muffs that are used for double hearing protection only are required to have an NRR of ≥19.
10. Muffs used as a "primary" hearing protector in accordance with the above case-by-case situation, must be of a 30 NRR or greater.

46.8 Foot Protection

1. Use required protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, objects piercing the sole, or where exposed to electrical hazards. The tables in this section provide guidance on adequate foot protection for common exposures. When in doubt, contact your supervisor.
2. Footwear designed for industrial work exposures and constructed of substantial materials is required in industrial environments. Substantial materials are strong, durable materials that provide protection against abrasions, heat, flame, chemical irritants, oils, and limited impact forces. Leather is the most common material that meets the criteria.
3. Maintain shoes and shoelaces in clean and serviceable condition.
4. Safety shoes meeting Class 75 requirements ASTM F2413 Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear, are required for employees in construction, maintenance, and materials-handling work activities.
5. All safety footwear will meet the following:
    a. Meet ASTM F2413 requirements. Athletic type safety footwear with steel/composite toes meeting these requirements is approved.
    b. Rated for EH (electrical hazard).
    c. Have sole and heel materials that are slip resistant.
6. Contract employee footwear provisions shall be addressed by the contracting company. TVA will not provide protective footwear to contract employees.
7. Visitors, contractors, and new employees without the appropriate footwear are restricted to administrative/office areas.
8. Shoes should have ankle support/protection (shoe material goes above ankle).
9. Prohibited shoes in any industrial environment include:
    a. Shoes made from cloth, canvas, or similar material
    b. Open toe or high heel shoes (heels more than 1 1/2 inches) or sandals
    c. Flip-flops or similar footwear (except in showers and adjacent locker rooms). Flip flops, sandals, or other thong type footwear is not permitted at Nuclear Generating Facilities.
    d. All footwear shall have a defined heel up to 1 1/2 inches. When walking beams or other working surfaces where the defined heel may create a hazard or is not appropriate for the work, workers may wear a safety shoe with a flat or wedged sole providing the shoe provides adequate protection for the work being performed.
10. Certain employee job classifications require wearing safety footwear:

Job Classifications Requiring Safety Footwear		
Assistant Unit Operator	Boilermaker	Conveyor/Car Dump Operators
Deckhand	Electrician	Groundsmen
Heavy Equipment Operator	Instrument Mechanic	Laborer
Lineman	Machinist	Material Handler/Power Stores
Mechanical Tech	Pipefitter	Property Maintenance Worker
Technician Level 1-4	Technician 5 and Foreman	Unit Operator

Selection of Suitable Foot Protection		
Operation	**Hazard**	**Protective Features**
Chemical handling, dip tank operations, etc.	Chemical burns	Rubber boots with close fitting tops, protective toe box
Construction Activities	Punctures, impact, hot slag	Flexible steel insoles, protective toe box, instep protection, high-top shoe
Hot material handlers	Hot materials entering top of footwear	Lace-up or elastic upper type footwear
Jackhammer and tamper work	Impact	Instep protection, protective toe box
Machine Shop - Heavy	Impact	Instep protection, protective toe box
Mowing grass, right of way clearing	Cut or impact	Boot or high-top work shoe, protective toe box
Tug and Barge work	Slipping and impact	Non-slip soles, protective toe box
Working in cement, oil, mud, water, etc.	Dermatitis	Rubber knee boots, protective toe box
Hazardous materials spills	Chemical burn/dermatitis	Rubber knee boots, protective toe box

46.9 Respirators

1. TVA has a written respiratory program in TVA-TSP-18.916. This section contains all the requirements for safe use of respirators.
2. When planning work, use engineering and administrative controls to the extent possible to reduce exposure and eliminate the need for respiratory protection.
3. Use respirators when exposed to harmful concentrations of toxic vapors, gases, dust, or oxygen deficiency which cannot be controlled by other means.
4. Keep facial hair clean-shaven on facial areas where the sealing surface of the respiratory device contacts the skin.
5. Perform an inspection of respiratory equipment with each use.
6. Do not wear headphones, jewelry, or other articles that may interfere with the face-to-respirator seal.
7. Replace filters when damaged, soiled, or causing noticeably increased breathing resistance (e.g., causing discomfort to the wearer).
8. Conduct user seal checks, (fit-checks), each time you wear a respirator. Use either positive or negative pressure check, or both, (depending on which works best for them).
9. A current fit test is required before being allowed to wear any respirator with a tight-fitting facepiece (except for voluntary use dust masks), and when there are changes in the employee's

physical condition that could affect respiratory fit (e.g., obvious change in body weight, facial scarring, dentures, etc.). All employees that may wear a respirator, with the exception of voluntary use dust masks, shall be fit tested annually.

10. Replace or repair the respirator if vapor breakthrough is detected, there are changes in breathing resistance, or leakage of the facepiece occurs.
11. Only enter Immediately Dangerous to Life and Health (IDLH) in emergency situations.
12. Properly maintain and clean the respirator.
13. Replace worn or deteriorated parts prior to re-use.
14. Do not attempt to replace components, make adjustments, or make repairs on any respirator beyond those recommended by the manufacturer.
15. Never substitute parts. Such substitutions will invalidate the approval of the respirator.
16. Immediately remove any respirator that malfunctions from service, disposed of in a manner that will prevent someone else from using this respirator, and replaced with a new respirator of the same model and size. Remove any Self-Contained Breathing Apparatus (SCBA) that malfunctions are immediately removed from service, tag with a defective equipment tag, and send for repair to the Emergency Response Training Center (ERTC).
17. Store respirators in a manner that protects them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and to prevent deformation of the facepiece and exhalation valve.

47 Pesticides and Herbicides

Pesticides and herbicides are regulated by the Environmental Protection Agency. Therefore, additional requirements will apply that are not covered in this section. Contact TVA Environmental for guidance. To use pesticides and herbicides safely:

1. Read the precautionary statements on the label and the Safety Data Sheet (SDS) before working with pesticides and herbicides to ensure the proper precautions are being taken and employee protections are in place.
2. Apply chemicals in a manner that does not cause danger to other people.
3. Do not use pesticides and herbicides unless hand washing facilities are available.
4. Immediately wash your hands if they come in contact with a pesticide or herbicide.
5. Keep container labels in good condition so that they remain legible.
6. Store pesticides and herbicides in rooms away from food or water.
7. Check the label information or the SDS for special storage requirements.
8. An exhaust fan for ventilation shall be used in storage rooms to reduce the temperature and high concentration of toxic fumes. The ventilation system shall be designed to maintain the pesticide concentration below the accepted human exposure levels, or for a minimum of six air changes per hour, whichever method yields the higher number of air changes.
9. The ventilation rate shall be based on the following:
    a. Amount of the pesticide spilled, based on the worst credible case, which is dependent on the capacity of the largest stored pesticide container
    b. Volatility of the pesticide spilled (i.e., its vapor pressure)
    c. Accepted human exposure level as specified on the pesticide Safety Data Sheet (SDS) or the pesticide container label.
10. The location of both the exhaust and inlet air openings shall be arranged to provide, as far as practicable, air movements across all portions of the floor to prevent accumulation of toxic or flammable vapors. Air shall be exhausted from the room directly to the exterior of the building without recirculation.
11. Indoor storage areas and buildings for the storage of pesticides shall be provided with emergency mechanical exhaust ventilation, which shall be manually actuated upon detecting a spill, leak, or release.
12. Compressed gas pesticides shall:

a. Be stored in an outdoor, covered area away from heat (e.g., steam pipes, heaters, direct sun).
b. Whether full or empty, containers shall be tightly closed, provided with a safety cap when not in use, and provided with labeling to indicate whether the individual container is full or empty.
c. Containers shall be separated by type, contents, and full or empty status.
d. Compressed gas pesticides shall be separated from other compressed gases by pipe railings or other effective means acceptable by your BU Fire Protection Program Manager/Engineer, as appropriate.

13. For the operator's safety, replace cracked or worn hoses on applicator equipment.
14. If the solvent used is toxic or flammable (or both), be sure the mixing operation is performed in an area where ventilation is adequate.

48 Plan Jobs Safely (Pre-Job Briefs/Job Safety Analysis)

The need to perform pre-job briefs and job safety analysis shall be determined by adherence to TVA-TSP-18.006, Plan Jobs Safely.

49 Portable Heating Equipment

1. Use safety stands with oil-fired or kerosene-fired space heaters designed for safety stand use.
2. Store fuel in an approved, properly labeled, container.
3. When using oil-fired or kerosene-fired space heaters:
   a. Use only in properly ventilated areas.
   b. Do not operate where flammable vapors or dust presents an explosion hazard.
   c. Properly maintain and inspect before use.
   d. Do not operate close enough to combustible material or clothing to create a fire hazard.
   e. Do not leave unattended while in operation.
   f. Refuel outdoors
   g. Do not transport, refuel, or light while hot.

50 Pressure Washing/Hydroblasting

1. Operate pressure washing and hydroblasting equipment in accordance with the manufacturer’s recommendation.
2. Wear proper PPE when operating the equipment. At a minimum, this includes gloves, safety glasses, face shield, and proper footwear.
3. Avoid contact with the high-pressure stream of water. Keep your hands, feet and body out of the line of fire.
4. Hang on to the spray wand with both hands to ensure control of the wand.
5. Never point the sprayer at another person, regardless of whether the equipment is operating or not.
6. Maintain good footing. Do not overreach and lose your balance.
7. Be aware of any electrical equipment in the area and take precautions necessary to protect electrical equipment from the water. When working around electrical equipment, adhere to the minimum safe approach distances outlined in this manual.
8. Barricade the area to protect others and minimize traffic.
9. Inspect the hoses and connections before operating the equipment.

51 Radiography

All radiography operations outside of Nuclear Power Group shall be conducted in accordance with TVA-TSP-18.811, Radiography Operations

52 Railroad Operations

1. Only authorized employees who have received railroad safety training and have passed a practical skills test are permitted to operate railroad equipment.
2. Before a locomotive is moved, sound the horn to warn employees in the area.
3. Locomotive speed in yard shall not exceed 5 miles per hour. Locomotive speed on main line shall not exceed 10 miles per hour.
4. Maintain at least an arms length distance from any rotating or moving equipment at all times.
5. When stepping from between rail cars, watch for moving equipment working on adjacent tracks.
6. Immediately report defects or obstructions found on tracks or bridges to your supervisor/foreman. If the contract rail carrier utilizes the tracks in question, the master dispatcher for the railroad company shall be notified.
7. Following any derailment, the track in the area must be inspected prior to going back into service.
8. Never crawl under a railroad car until clearance precautions have been taken for maintenance or repair and all energy is isolated. Clearance precautions, as a minimum, include:
    a. Three-way communications with the operator and the switchman on repairs
    b. The duration of time needed to complete the work.
    c. Rail car shall not be moved until the maintenance employee communicates face to face with the locomotive operator and switchman that all work is complete.
9. When the locomotive is in service, never crawl over or between couplings unless clearance precautions have been taken for maintenance or repair.
10. Never ride on the lead footboard of an engine or sit on handrails, uncoupling rods, or draw heads of engines or rail cars.
11. A blue flag or lights must be used to designate tracks which are closed to prevent movement beyond that point.
12. Any signal, voice, or radio communication that is not fully understood by the train operator shall be considered a stop signal until resolved.
13. Avoid walking or standing on the tracks except in the performance of assigned duties.
14. All hand, light, or radio signals from the switchman or other employees must be transmitted from a position that can be clearly understood by the engineer from his/her normal operating position.
15. Ensure that rail car brakes are properly set before leaving them uncoupled from the engine.
16. Do not intentionally roll cars.
17. Both the conductor and engineer are responsible for the safety of their train and observance of the rules that govern operations including, but not limited to, the unloading process.
18. Any person not classified as authorized to be in the car dumper area shall receive permission first of the supervisor/foreman and then the operator and switchman before entering the area. Visitors shall be escorted at all times and shall report to the switchman and operator when leaving the car dumper area.
19. Wear proper PPE. Minimum requirements include a hard hat, safety glasses with side shields, gloves, hearing protection, and mono goggles available in case of windy or dusty situations.
20. Do not use cell phones during the operation of locomotives. This includes talking, texting or use of any applications which may be on the phone.

52.1 Switching

1. While switching, the engineer must remain at the controls.
2. Employees engaged in switching or dumping cars may not use their feet to line up draw heads.
3. The train cannot move until the switchman is in line of sight of the operator or clear communication has been established and understood.
4. Cars being separated must have the air fully bled off and the brakes set before the engine leaves the site.
5. Only the person throwing the switch may be in the immediate vicinity of switching operations.
6. Manual running switching is prohibited.

52.2 Locomotive Operations

1. Visitors shall not be permitted to ride on any locomotive unless authorized to do so by the supervisor/foreman and only for performance of work.
2. Locomotives must pass a safety check performed by the engineer daily. If the locomotive is found to have defects that could affect the safe operations of the equipment, the locomotive shall be immediately taken out of service until the repairs can be completed. Repairs to locomotives shall only be conducted by authorized employees or vendors.
3. Coupling operations on a grade require an adequate number of hand brakes be set before the air is broken and the locomotive uncoupled.
4. The locomotive may not be moved until the engineer has a clear understanding of yard conditions. Yard conditions shall be thoroughly discussed in the pre-job briefing. Any conditions that impose a hazard to employees shall be mitigated prior to beginning the unloading operation.
5. When a railroad car is stopped for unloading, the car shall be secured from displacement that could endanger employees. In the case of the rotary car dumper, all components of the dumper shall be fully operational prior to dumping.
6. An emergency means of stopping dump operations shall be provided at rail car dumps.
7. In the case of fog, three-way communications by radio shall be utilized at all times.
8. Emergency application of air brakes requires inspection of equipment before continuing operations.

52.3 Rotary Car Dumpers

1. Rail car dump operations require two employees at the car being dumped, one on each end of the dumper to observe clearances and ensure safe operations.
2. The rail car dump employees must be in continuous visual, verbal, or radio communication.
3. When the loss of communication exists, the operations shall be stopped immediately.
4. During normal operations, no unauthorized employee is to approach the car being dumped while it is in the rail car unloading position.
5. If a rail car retarder is inoperative, the use of hand brakes is required, and a safe work plan must be developed before beginning operations.
6. Remote control devices used to maneuver cars must be maintained in safe operating condition at all times. The remote control shall be tested prior to operation.
7. Employees involved in rotary car dumper operations are responsible for ensuring the tracks are clear before moving the rail cars and that other personnel maintain a safe distance from the operations.
8. Signs must be posted stating "**DANGER - DUMPER OPERATION - AUTHORIZED EMPLOYEES ONLY**" at each end of the dumper building.
9. Any person not classified as authorized to be in the car dumper area shall receive permission first of the supervisor/foreman and then the operator and switchman before entering the area. Visitors shall be escorted at all times and shall report to the switchman and operator when he/she leaves the car dumper area.
10. Repair of derailments inside the rotary car dumper requires a safe work plan prior to beginning the repair process. When the repairs are complete, a qualified employee/Original Equipment Manufacturer (OEM) representative shall inspect the car dumper prior to operation.

52.4 Bottom Dump Operations

1. All employees involved in the bottom dump operation shall have a radio for communication. Three-way communication is encouraged to ensure the directions are clear for all employees.
2. The use of hand signals is permitted if all employees have line of sight to the locomotive switchman.
3. When the locomotive is approaching the bottom dump pit area with a cut of rail cars, the locomotive operator shall initiate a short blast of the horn to ensure all employees are made aware of the presence of the train.

4. When the rail cars are positioned to begin the dumping operation, the switchman is the person of authority to instruct the locomotive operator.
5. The locomotive operator shall not initiate movement of the rail cars unless he/she clearly understands the switchman's commands.
6. Each rail car hot shoes shall be inspected prior to the rail car entering the dump pit area. Maintenance on hot shoes, if possible, shall be conducted outside of the pit area to eliminate the fall potential onto the Grizzly or into the pit.
7. Ensure the rail car(s) are centered over the dump pit when the rail car enters the dump pit.
8. If the dump solenoid is activated and the dump gates on the rail car do not open, the bypass solenoid switch will activate the manual bypass valve. When operating the manual bypass solenoid valve switch, a fall potential exists onto or into the pit.
9. When the manual solenoid switch must be operated, make sure the locomotive operator understands exactly what you will do to open the switch. The locomotive operator shall not move the rail cars until instructed by the switchman all employees are clear.
10. Never climb on a handrail or guard to operate the manual solenoid switch.
11. Under no circumstances will the employee climb over the coupling of the rail car to gain access to the other side of the rail car.
12. The switchman is responsible for monitoring the level of the dump pit. Do not over fill the pit onto the railroad tracks because a buildup of spilled coal could cause the rail car to de-rail.
13. When the locomotive is required to move the rail cars, a short blast of the locomotive horn is required to warn all employees of the movement.
14. If an employee is required to step between rail cars to make up hoses or perform other activities, the employee shall have three-way communications with the locomotive operator prior to entering.
15. If air lines are required to be disconnected, ensure the air is isolated and bled off prior to breaking the air coupling.
16. All damaged rail cars shall be reported in writing to the foreman/supervisor.
17. When the rail cars are dumped and ready to return to the interchange yard, the locomotive operator shall contact the contract rail carrier to ensure the two trains do not meet while returning to the interchange yard.
18. If the contract rail carrier is required to deliver products other than coal (example, anhydrous ammonia) on TVA property, communication shall be initiated with the contract carrier before travelling to the interchange yard. If the locomotive radio cannot contact the contract rail carrier locomotive, the yard supervisor/foreman shall contact the master dispatcher for the rail accessibility. The contract carrier master dispatcher is responsible for all train movements on the railways.
19. When the dumping of the rail cars is complete, all handrails and guards shall be placed in the proper location to prohibit employees and visitors access to the dump pit area.

52.5 Inspection of Locomotives

1. Each locomotive in use must be inspected at least once during each calendar day for any condition that would endanger the safety of the crew, locomotive or train. A written report of the inspection shall be made and maintained for three years.
2. If the locomotive is not used on any particular calendar day, the words "**NOT USED**" shall be entered on the report.
3. Locomotive engineers or other designated employees are considered qualified to make the inspection.
4. If the inspection of the locomotive reveals a defect which will require correction before the locomotive is used, this must be immediately brought to the attention of supervisory personnel so that necessary repairs may be arranged.
5. A qualified mechanic shall conduct all repairs of locomotives. When the repairs are completed, the locomotive shall be re-inspected and signed off by a qualified mechanic prior to use.

6. Minimum inspection criteria include:
    a. Fan openings, exposed gears and pinions, and exposed moving parts must be inspected to determine that no significant safety hazard exists.
    b. The exhaust manifold system and connections must contain no breaks, cracks, or openings creating an obvious exhaust gas leak into the engine compartment.
    c. The locomotive brakes must be tested to determine they operate as intended. The test shall include operating the independent and automatic brake valves to observe that the brakes apply and release properly. Water and oil must be drained from the main air reservoir.
    d. Couplers and uncoupling mechanisms shall not be bent or broken and must function as intended. A coupler, when not coupled to any other equipment, shall be operated with the uncoupling level, and the knuckle must move to the open position freely. The coupler must be inspected to determine that it is free of any cracks, and that the coupler carrier is not broken and secured in position.
    e. The emergency brake valve must be properly marked. There is no requirement that the valve be tested when the daily inspection is performed to determine if it will initiate an emergency application of the locomotive brakes.
    f. A visual inspection of all plates covering a high voltage electrical apparatus must be performed to determine that they are secured in their proper locations.
    g. Determine that jumper cables are properly stored (ends of cables shall not be hanging free) and do not create a tripping hazard.
    h. Visual inspection of traction motors and generators must be made to ascertain they are free of excessive accumulations of oil, all visible cables and cable connections are free from damage, and no traction motor is cut out.
    i. Visual inspection of the three safety cut-off devices must be made to determine they are properly marked and free of any obstruction, which could prevent their operation. Testing of the push-button type electrical safety cut-off device will result in an immediateengine shut down of a locomotive.
    j. Visual inspection of the speed indicator equipment to ascertain that the indicator and related apparatus is undamaged.
    k. Visual inspection shall be conducted of passageways, walkways, cab control compartment floors, and engine compartment floors. Accumulations of oil, water, debris, and other items shall only be reported if the condition presents an immediate hazardous and unsafe condition for any person who would use them, e.g., oil accumulation does not provide secure footing or creating a slipping hazard. A visual inspection of the cab seats and windows must also be made to determine the seats are properly secured to the floor or sides and the cab windows provide clear vision and are free of broken areas, which could create an injury hazard.
    l. Inspect the headlights to ascertain they operate properly, and that they can be dimmed as required.
    m. Visual inspection of the cab lights must be performed to ascertain they are operative and provide sufficient illumination. Passageway lights used to illuminate walkways over which railroad personnel walk must be lighted.
    n. Operate the horn to ensure that it functions. The locomotive bell, when equipped, shall also be tested for operation.
7. A written report shall be prepared by the railroad inspector after the inspection of a locomotive has been completed. The report must contain:
    a. The number of the locomotive.
    b. The place.
    c. The date.
    d. The time of the inspection.
    e. A description of any non-complying conditions disclosed by the inspection.
    f. The signature of the employee making the inspection.

8. All non-complying conditions reported by the inspector must be repaired before the locomotive is used. The inspector performing the inspection shall also examine any work reports found on a locomotive, which may have information entered by previous engineers regarding defective conditions, and these items shall be inspected. The report of deficiencies and the report of repair shall be maintained for three years.
9. Any non-complying safety critical condition, found by an inspector and not included in this list, shall also be reported.

53 Rigging

All rigging operations must be performed in accordance with TVA-TSP-18.721, Rigging and the TVA Rigging Manual. Rigging equipment purchased by TVA must meet specific procurement specifications in accordance with TVA-TSP-18.721, Rigging.

54 Scaffolds and Temporary Work Platforms

Nuclear Power Generating Plants adhere to MMTP-102 for scaffolding requirements.

1. Do not work from any scaffold that has not been inspected and does not have TVA Form 19590, Scaffold Permit or equivalent attached..
2. A scaffold competent person shall inspect all scaffolds and temporary work platforms before they are placed into service, following any alteration and before each shift the scaffold is to be used. The competent person shall determine that the scaffold is safe and constructed in accordance with manufacturer requirements and the requirements of this section.
3. All scaffold footing shall be sound, rigid, and capable of carrying the maximum intended load without settling or shifting. Piping, handrails, conduit, cable trays shall not support scaffolds, or similar structures unless an engineer has inspected the work site and determined that the structure is capable of supporting the scaffold with four (4) times the maximum intended load.
4. Wire rope used for suspended scaffolds shall support six times the maximum intended load.
5. Maintain scaffolds and temporary work platforms in a safe condition.
6. Do not alter scaffolds or move scaffolds horizontally while they are in use or occupied.
7. Frames and accessories shall be maintained in good repair. Defects, unsafe conditions, or noncompliance with this section shall be corrected before further use of the scaffold. Broken, bent, altered, excessively rusted or otherwise structurally damaged frames or accessories shall not be used.
8. Do not load scaffolds in excess of the working load for which they are intended.
9. Access scaffolds by an access ladder or equivalent safe access. Never climb the supports.
10. The poles, legs, or uprights of scaffolds shall be plumb, and securely and rigidly braced to prevent swaying and displacement.
11. When hoisting materials onto a scaffold, use a tag line.
12. When overhead hazards exist, provide overhead protection for workers on the scaffold.
13. Do not work on scaffolds during storms or high winds.
14. Do not work on scaffolds which are covered with ice or snow, unless all ice or snow is removed, and planking sanded to prevent slipping.
15. Do not allow tools, materials, and debris to accumulate in quantities to cause a hazard.
16. Do not use shore scaffolds or lean-to scaffolds.
17. Use precautions to protect scaffold members, including any wire ropes, when using a heat-producing process.
18. All scaffolds and temporary work platforms shall be erected and dismantled by trained personnel.
19. Scaffolding and temporary platforms shall not be erected on or supported by structures and components that could be subjected to damage from overloading or could create a potentially

hazardous work environment (i.e., asbestos release, release of live steam, etc.) without an evaluation by the plant manager or his/her designee.

20. When a scaffold is no longer required, the responsible supervisor shall have the scaffold dismantled and properly stored no later than the next working day.
21. Do not erect metal scaffolds under generators that are in operation.
22. Use caution when erecting or disassembling scaffolds near the main generator or isophase bus ducts during plant operations and evaluate the potential for induced voltage.
23. Guardrails are required on scaffolds and temporary work platforms over 4 feet high and must consist of a top rail 38-45 inches above the work surface, a mid-rail, and a 4-inch toe-board or other method to prevent objects from falling to levels below. This protection is required on all sides of the platform unless an equivalent means of fall protection or dropped object prevention is provided.
24. Guardrails shall be provided on all scaffolds over water, moving machinery, or hot or hazardous materials.
25. Guardrails shall be made of rigid material. The top rail shall be constructed of 2 x 4 inch lumber or material of equivalent or superior strength. The upright supporting posts shall be equivalent to 2 x 4 inch lumber or material of equivalent or superior strength, plumbed on not more than 8 foot centers. Toeboards shall be 2 x 4 inch lumber or material of equivalent or superior strength.
26. When it is necessary for persons to pass or work under a scaffold, a screen consisting of number 18-gauge US standard wire, 1/2-inch mesh, or equivalent shall be provided between the toeboard and the guardrail.
27. Whenever scaffolds must be constructed outside the construction specifications detailed in **29 CFR 1910.28**, a registered professional engineer (PE) must design the scaffold and it must be built in accordance with the engineer's design. A copy of the scaffold design drawings shall be kept at the plant/facility for review. The 3 specifications that determine the need for a PE are scaffold height, distributed floor load of the scaffold and scaffold board span.
28. The following are specific "trigger" points:
    a. Tube and coupler light duty scaffolds, with heights exceeding 125 feet for one working level, 25 pounds per square foot uniformly distributed loads and planking spans exceeding 10 feet. The height level decreases to 91 feet for three working levels.
    b. Tube and coupler medium duty scaffolds, with heights exceeding 125 feet for one working level, 50 pounds per square foot uniformly distributed loads and planking spans exceeding 8 feet. The height level decreases to 78 feet for two working levels.
    c. Tube and coupler heavy duty scaffolds, with heights exceeding 125 feet, 75 pounds per square foot uniformly distributed loads and planking spans exceeding 6 -1/2 feet.
    d. Wood pole scaffolds with heights exceeding 60 feet.
    e. Needle beam scaffolds with platform spans exceeding 8 feet.
29. A scaffold permit is required for scaffolds over four (4) feet high. Permits shall be consistent with the color scheme below unless called out differently by a business unit specific procedure, e.g. white tags required by NPG MMTP-102 are considered equivalent and are permissible.
    a. **Green** - Complete Scaffold, No Fall Protection Required, TVA Form 19590B
    b. **Yellow** - Incomplete Scaffold, Fall Protection Required, TVA Form 19590C
    c. **Red** - Do Not Use, TVA Form 19590D
30. If the scaffold is four (4) feet or lower, ensure that the platform is structurally safe and has a safe means of access. If the work location restricts the use of a scaffold, ensure that the ladder or other means of access to the point for work is safe.
31. Sites shall establish a system for tracking scaffolds to ensure accountability and to identify scaffold location. A permit log, TVA Form 19590A is one option for meeting this requirement. A separate scaffold permit log for contractors may be located at the discretion of the plant manager. Smaller contractor groups must use the plant scaffold permit log.
32. Foremen or supervisors responsible for work to be performed that requires a scaffold shall initiate the permit. If an existing scaffold is to be left in place for use by another craft or contractor, the responsibility for maintenance and safety of the scaffold shall be transferred to the next

responsible supervisor/foreman. Upon transfer, a new permit will be initiated, and the permit log so noted. The erecting competent person shall close out the permit and log entry.

33. When a scaffold has been dismantled, the responsible foreman/supervisor shall complete the permit and close the permit log and turn the completed permit into the responsible supervisor.
34. All completed permits and logs shall be maintained on file for 90 days.
35. On a daily basis, scaffolds NOT in USE will be signed, dated, and marked "Hold Until" with date and reason by the competent person. A scaffold that is expected to remain in hold status longer than 30 days shall require approval from the plant manager.
36. Whenever it is necessary for another crew or group to use an existing scaffold, the responsible foreman or supervisor shall verify that a competent person has inspected the scaffold to ensure that it is safe for use.
37. Periodic inspections shall be made of all scaffolding components and accessories, and any maintenance, including painting, or minor corrections authorized by the manufacturer shall be made before further use.
38. Scaffold components shall be maintained and stored in areas that protect the scaffold from damage.
39. All partner and contractor work involving the use of scaffolds and temporary work platforms shall be consistent with the applicable OSHA requirements and shall use TVA Scaffold Permits as defined by this section.
40. No employee shall work from any scaffold that does not have a current, complete scaffold permit attached.
41. When it is not feasible to install guardrails, fall protection must be provided by means of a personal fall arresting system consisting of a safety harness, lanyard, shock absorber, and lifeline attached to an approved anchorage point. The scaffold shall have a yellow scaffold permit affixed to the access ladder identifying the “Use of Fall Protection is Required on this Scaffold.”
42. On suspension scaffolds, in addition to the standard guardrails, fall protection must be provided to the workers by means of a personal fall arresting system tied off to an independent structure.
43. Designated points on the scaffold may be used for anchorage points only when it is not possible to obtain an independent anchorage point, and the following conditions are met:
    a. The scaffold anchorage point is capable of supporting at least 5,000 pounds, or
    b. The scaffold anchorage point is designed, installed, and used as part of a complete fall arrest system which maintains a safety factor of at least two.
44. In addition, documentation must exist to show the scaffold anchorage point was engineered by a competent person to meet the requirements for a scaffold anchorage point. The use of a scaffold as an anchorage point is not permitted under any circumstances for single-point suspended and two-point suspended scaffolds.

54.1 Scaffold Planking

1. Evaluate the work to determine the best planking for the work to be performed. For example, when wood planking is used, understand the limitations of wood planking in adverse conditions such as adjacent to steam lines where wood may dry out or when evaluating the use of aluminum planking, consider hazards such as energized electrical equipment that outweigh theadvantage of the planking lighter materials.
2. Wood planks used in construction of scaffolds shall be made of scaffold grade 2 x 10-inch nominal or equivalent.
3. Special laminated planks or aluminum scaffold planks may also be used as appropriate.
4. All scaffold decking must be fully planked when possible. At no time will decking be less than two planks wide or minimum of 18 inches.
5. All decking must be placed so that no more than one inch exists between planks so that material may not fall and strike someone below.
6. Decking cannot be more than 14 inches from the edge of the work/structure or guard rail system or fall protection must be used.

7. All planking shall be overlapped a minimum of 12 inches or secured from movement. Planks shall extend over their end supports not less than 6 inches or more than 18 inches. The ends of the planks shall not be abutted.
8. Plywood shall not be used as a platform material except to cover floor openings where objects may be likely to fall to an area below or when the system has been designed to conform to performance and load bearing requirements set forth by OSHA standards.

54.2 Tube and Coupler Scaffolds

1. A light duty tube and coupler scaffold shall have all posts, bearers, runners, and bracing of nominal 2- inch O.D. steel tubing. The posts shall be spaced no more than six feet apart by 10 feet along the length of the scaffold.
2. A medium duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2- inch O.D. steel tubing. Posts spaced not more than 6 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2- 1/2-inch O.D. steel tubing. Posts spaced not more
    t. than 5 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal2-inch O.D. steel tubing.
3. A heavy-duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing, with the posts spaced not more than 6 feet apart by 6 feet 6 inches along the length of the scaffold.
4. Posts shall be accurately spaced, erected on suitable bases, and maintained plumb.
5. Runners shall be erected along the length of the scaffold located on both the inside and the outside posts at even height. Runners shall be interlocked to form continuous lengths and coupled to each post. The bottom runners shall be located as close to the base as possible. Runners shall be placed not more than 6 feet 6 inches on centers.
6. Bearers shall be installed transversely between posts and shall be securely coupled to the posts bearing on the runner coupler. When coupled directly to the runners, the coupler must be kept as close to the posts as possible.
7. Bearers shall be at least 4 inches but not more than 12 inches longer than the post spacing or runner spacing. Bearers may be cantilevered for use as brackets to carry not more than two planks.
8. Cross bracing shall be installed across the width of the scaffold at least every third set of posts horizontally and every fourth runner vertically. Such bracing shall extend diagonally from the inner and outer runners upward to the next outer and inner runners.
9. Longitudinal diagonal bracing shall be installed at approximately a 45-degree angle from near the base of the first outer post upward to the extreme top of the scaffold. Where the longitudinal length of the scaffold permits, such bracing shall be duplicated beginning at every fifth post. In a similar manner, longitudinal diagonal bracing shall also be installed from the last post extending back and upward toward the first post. Where conditions preclude the attachment of this bracing to the posts, it may be attached to the runners.
10. The entire scaffold shall be tied to and securely braced at intervals not to exceed 30 feet horizontally and 26 feet vertically.

54.3 Tubular Welded Frame Scaffolds

1. Spacing of panels or frames shall be consistent with the loads imposed.
2. Scaffolds shall be properly braced by cross bracing or diagonal braces, or both, for securing vertical members together laterally, and the cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, square, and rigid. All brace connections shall be made secure.
3. Scaffold legs shall be set on a level concrete floor, or the legs shall be set on adjustable or plain bases placed on foundations adequate to support the maximum intended load.
4. The frames shall be placed one on top of the other with coupling or stacking pins used in every joint to provide proper vertical alignment of the legs.

5. Panels shall be locked together vertically by pins or other equivalent suitable means.
6. To prevent movement, the scaffold shall be secured at intervals not to exceed 30 feet horizontally and 26 feet vertically.
7. Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.

54.4 Outrigger Scaffolds

1. Outrigger beams shall extend not more than 6 feet beyond the face of the building or structure.
2. The beams shall rest on edge, the sides shall be plumb, and the edges shall be horizontal.
3. The beam shall be secured in place against movement and shall be securely braced at the fulcrum point against tipping.

54.5 Two-point suspension Scaffolds (Swinging Scaffolds)

1. Suspension scaffolds shall comply with the requirements of ANSI/ASSP 10.8, Scaffolding Safety Requirements.
2. Two-point suspension scaffold platforms shall be not less than 20 inches or more than 36 inches wide overall. The platform shall be securely fastened to the hangers by U bolts or by other equivalent means.
3. The hangers of two-point suspension scaffolds shall be made of wrought iron, mild steel, or other equivalent material having a cross-sectional area capable of sustaining four times the maximum intended load, and shall be designed with a support for guardrail, intermediate rail, and toeboard.
4. Hoisting machines used on two-point suspension scaffolds shall be of a design tested and approved by a nationally recognized testing laboratory.
5. Two-point suspension scaffolds shall be suspended by wire ropes.
6. On suspension scaffolds designed for a working load of 500 pounds, no more than two men shall be permitted to work at one time. On suspension scaffolds with a working load of 750 pounds, no more than three men shall be permitted to work at one time. Each worker shall be protected by a fall arrest system.

54.6 Single Point Adjustable Suspension Scaffolds

1. The scaffolding, including power units or manually operated winches, shall be tested and listed by a nationally recognized testing laboratory.
2. All power operated gears and brakes shall be enclosed.
3. In addition to the normal operating brake, all power-driven units must have an emergency brake which engages automatically when the normal speed of descent is exceeded.
4. The hoisting machines, cables, and equipment shall be regularly serviced and inspected after each installation and every 30 days thereafter or before the next use.
5. The supporting cable shall be straight for its entire length, and the operator shall not sway the basket and fix the cable to any intermediate points to change his original path of travel.
6. Equipment shall be maintained and used in accordance with the manufacturers' instructions.

54.7 Mobile Scaffolds

1. The maximum height of any mobile scaffold shall not exceed four times the minimum base dimension.
2. All casters shall have a positive locking device which shall be kept locked whenever persons are working on the scaffold. Two of the casters shall be of the swivel type.
3. Casters shall be properly designed for strength and dimensions to support four times the intended load.
4. The force necessary to move the mobile scaffold shall be applied near or as close to the base as practical and provision shall be made to stabilize the tower during movement from one

location to another. Scaffolds shall only be moved on level floors, free of obstructions and openings.
5. Personnel shall not be permitted to ride on mobile scaffolding.

55 Signs and Barricades

55.1 General

1. Use the correct sign or barricade tape color for the hazards involved:
    a. Danger (Red) - To be used in hazardous situations. Special precautions are necessary to avoid serious injury or death.
    b. Danger (Orange) - To be used for electrical hazards only. Special precautions are necessary to prevent serious injury or death.
    c. Warning - To be used in hazardous situations where failing to avoid the hazards could result in serious injury or death.
    d. Caution - To be used to warn of potential hazards or to caution against unsafe practices that could result in minor or moderate injury.
    e. Safety Instruction Signs (such as Notice) - To be used when there is a need for general instructions or suggestions related to safety measures, but not where there is a potential for personal injury.
2. The responsible foreman, supervisor, or person in charge is responsible for ensuring that adequate temporary barricades are installed and maintained.
3. The responsible foreman, supervisor, or person in charge must notify the appropriate operations personnel before any barrier is installed that could block the access to equipment or otherwise interfere with plant operations.
4. Commercially available yellow stand type signs such as “Caution Wet Floor” Signs meet the intent of a caution sign for the purposes of this section.

55.2 Safety Signs

1. After evaluating the hazards, use the guidance in Sign Selection Flow Chart in this section to select the appropriate sign.
2. Make sure signs are readily visible at all points of potential access.
3. Only post temporary signs for less than 60 days. Temporary signs must be removed when the hazard no longer exists.
4. Safety signs or tags used to warn of a specific hazard shall be consistent in language and design (i.e., a specific hazard located in various parts of the plant, shall have the same signage at each location).
5. Permanent signs must be durable enough to withstand exposure to surrounding conditions.
6. Handwritten signs are only allowed in emergency situations and may only be left in place until proper signs can be posted.
7. Computer generated paper signs are allowed in some cases. Computer generated signs are not allowed for safety notice, safety instruction, safety equipment location or fire equipment. Where computer generated signs are allowed:
8. The sign shall be protected in a manner to ensure durability such as a plastic sleeve or lamination.
9. Templates for computer generated signs can be found here.
10. Safety signs purchased or created after January 6, 2014, shall conform to ANSI Z535.2, Environmental Facility and Safety Signs, which is an OSHA consensus standard. These requirements are very specific, and a summary is outlined below.
11. Sign and wording colors are as follows:
    a. DANGER shall be in white letters on a red background.
    b. WARNING shall be in black letters on an orange background.

c. CAUTION shall be in black letters on a yellow background.
d. NOTICE shall be in italicized white letters on a blue background.
e. SAFETY INSTRUCTIONS or their equivalent shall be in white letters on a green background.
f. FIRE EQUIPMENT: Fire Equipment shall be either white letters on a red background or black letters on a red background.

12. Lettering requirements are as follows:
    a. Signal words shall be in sans serif font in upper case only.
    b. Message panel lettering shall be a combination of upper- and lower-case letters. Upper case lettering may only be used for short messages or emphasis of individual words.
    c. Lettering shall be of a size that enables a person to read the entire message at a safe viewing distance from the hazard and have reasonable hazard avoidance reaction time.
    d. Signal word letter height shall be at least 50% greater than the height of a capital H in the majority of the message panel wording.
    e. Letter size for safety notice, safety instruction, safety equipment location, and fire equipment location signs shall be:
        i. Of a size that enables a person to read the message from the expected viewing distance.
        ii. At least 50% greater than the height of a capital H in the majority of the message panel wording.

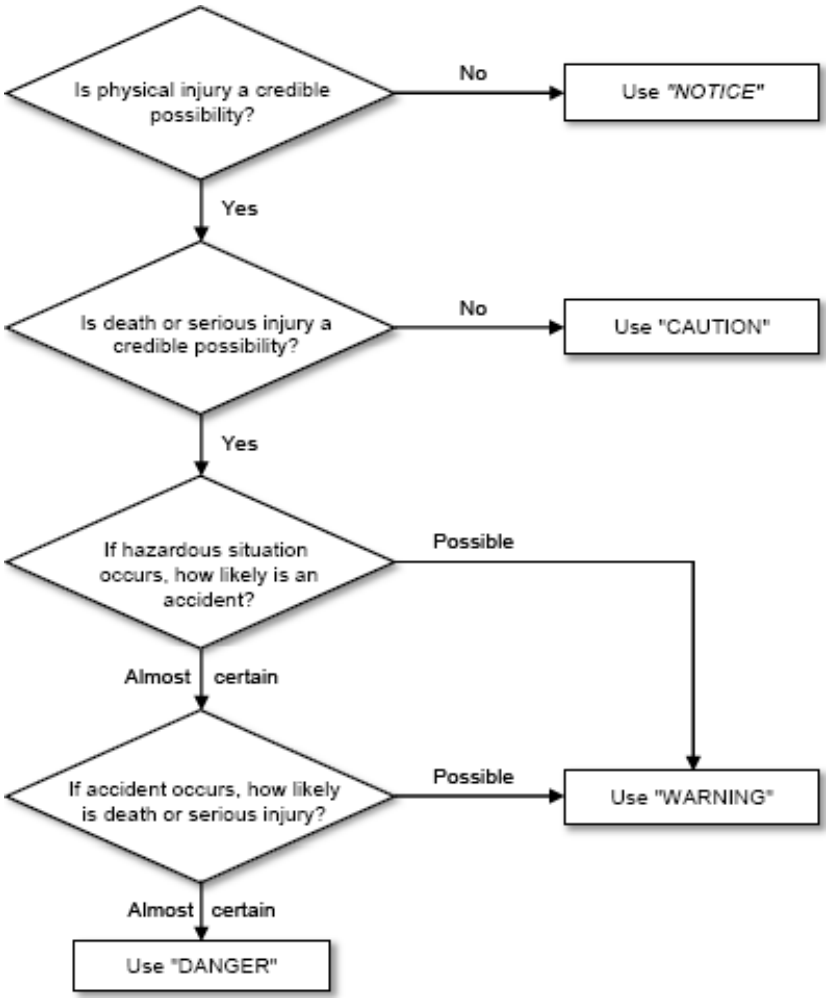
55.3 Safety Barricades and Barriers

1. Use a type of barricade that is appropriate for the hazard and the expected duration of the work.
2. When a large area must be barricaded, consider use of a designated entry and exit point.
3. Ensure barricades are set up and maintained in such a way that they are effective in warning workers of the hazard. Barricades shall surround the entire hazard unless other structures interfere with the barrier being capable of surrounding the entire hazard. Barricades must be placed in a manner that protects employees from the hazard.
4. Understand the hazards and how to protect yourself before entering any barricaded area.
5. Remove the barricade when the hazard for which the barricade exists is eliminated.
6. Never use conductive barricades around energized electrical equipment.
7. Post an appropriate sign or tag such as DANGER or CAUTION at all approachable sides. The sign or tag shall identifying the person in charge, the hazard, and contact phone number in areas where barricades are used.
8. Ensure safety signs or tags used to warn of a specific hazard are consistent in language and design (i.e., the same hazard barricaded in various parts of the plant shall have the same signage at each location).
9. Use the guidance in the Signs and Barricades section of this manual to ensure wording and signage is correct and consistent.
10. Position barricade tape to alert the viewer in sufficient time to take appropriate evasive actions to avoid the hazard.
11. Install barricade tape so that it is legible, non-distracting, and does not create another hazardous condition.
12. Ensure barricade tape is capable of withstanding the environment to which it is exposed. Replace damaged or ineffective barricade tape immediately.
13. Where red and black barricade tape is being used:
    a. If hazards involving fall potential such as floor and wall openings are left unattended for any reason, a barricade with a DANGER sign must be used to alert employees of the hazard. This shall be used as a temporary solution only and not as a substitute for an approved railing, floor hole covers, or a hole watch.
    b. Do not use red and black barricade tape for demarcating areas that are considered an

occupational illness hazard such as high noise areas.

14. Before crossing red and black danger taped areas:
    a. Obtain permission from the posting work group; and,
    b. Obtain a briefing on and fully understanding the hazards inside the boundary as well as how to avoid these hazards.
15. Where orange and black barricade tape is being used:
    a. Only use orange tape when designating areas of danger from electrical hazards.
    b. Use orange sag resistant barrier tape with the black legend "Danger, Electrical Hazard - Authorized Personnel Only".
    c. Only persons designated to work in the area shall cross orange taped areas.
    d. The preferred installation of orange tape is a height of 4 feet from ground level and at other locations as necessary to alert the viewer of the hazard.
16. Ensure orange tape surrounds the test set and equipment under test when a high potential is being used to test equipment. Only persons familiar with the test procedures and safety precautions shall be allowed to enter this area.
17. Install orange tape outlining the adjacent items of energized equipment when substation equipment such as circuit breakers and transformers are removed from service for maintenance and/or tests.
18. Where yellow and black barricade tape is being used:
    a. Post a sign or tag identifying the hazard if the area is not immediately occupied and controlled by the work group using the barricade tape.
    b. Signs or tags shall be readily visible at all points of potential access.
    c. Employees crossing caution tape shall read the caution tag or sign instructions and understand the hazards and steps necessary to protect themselves before crossing the tape.

Sign Selection Flow Chart



56 Temporary Traffic Control

1. Temporary traffic control on public roadways must be completed in accordance with TVA-TSP-18.815, Temporary Traffic Control. All traffic control set up on public roadways must meet the requirements of MUTCD Chapter 6.
2. Where traffic control is necessary on roadways that are not public, the traffic control set up must be adequate to protect employees from the hazards of oncoming vehicles. Contact TVA Safety Professional if assistance is needed.

57 Tools

57.1 General

1. All employees who use hand tools shall be trained in their proper use.
2. Use the right tool for the job and keep tools in good condition.
3. Use and maintain all tools in accordance with the manufacturer's instructions.
4. Inspect each tool for damage before use.
5. Remove defective tools from service.
6. Do not use cheaters to extend handles.
7. Use appropriate personal protective equipment (PPE) for the tool used and task performed.

8. In any work where flames are used, or sparks are produced, make sure that an explosive atmosphere does not develop.
9. Personal pocketknives shall not be used as a tool. Only knives provided by TVA shall be used.
10. Secure cutting tools in place while being sharpened.
11. When using a knife:
    a. Do not cut toward your body or toward your other hand.
    b. Store and carry knives correctly.
    c. Keep knife blades sharp.
    d. Use knives as designed. For example, do not use a box cutter to cut electrical tie-wraps. Use snips for this purpose.
12. Follow manufacturer recommendations for removal of batteries when battery operated tools are not in use.

57.2 Pneumatic Tools

1. Pneumatic tools are powered by compressed air and include grinders, nailers, staplers, chippers, drills, hammers, sanders, etc.
2. Maximum operating speed (RPM) shall be clearly marked on tools designed for use with attachments having speed limitations.
3. All employees who use pneumatic powered tools shall be trained. Supplemental training shall be conducted if inspections, observations, or accident studies indicate that these tools are not being properly used or maintained.
4. Never carry a tool by the hose.
5. Do not hold a finger on the switch while carrying a tool.
6. Keep hoses away from heat, oil, and sharp edges.
7. Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters, and grinding wheels. Follow instructions in the user's manual for lubricating and changing accessories.
8. Be certain the tool is in good condition and that attachments are securely mounted in place.
9. Do not use tools without the standard guards installed.
10. Check the supply hoses for damaged areas or loose connections.
11. If a tool has a “lock on” button, disengage before starting. Do not start the tool at the work area until ready to begin.

57.2.1 Operating Requirements

1. Set up screens to protect nearby workers from being struck by flying fragments.
2. Do not lay hose over ladders, stairways, scaffolds, or walkways in such a manner as to create a tripping hazard.
3. Never point a compressed air gun toward anyone. Do not “deadend" it against yourself or anyone else.
4. When disconnecting a tool or hose, turn the air supply off or use quick disconnect fittings. After the air supply is cut off, remember to depress the trigger on the tool to relieve the remaining air pressure.
5. Pneumatic power tools shall:
    a. Secured to the hose or whip by some positive means.
    b. Have safety clips or retainers securely installed and maintained.
    c. Have hose and hose connections designed for the pressure and service to which they are subjected.
6. Hose connections that are of the “Chicago” type coupling shall have safety pins installed.
7. Use only impact sockets on a pneumatic wrench.
8. Relieve air pressure prior to attempting to secure a broken pressurized air hose. Never attempt to grab a hose that is whipping around.
9. Never point pneumatic power tools at people or a part of your body.

10. Do not kink hoses to shut off the air supply.
11. Pneumatic tools used on energized electrical equipment or lines, or used where energized electrical parts may be contacted shall have protection against the accumulation of moisture in the air supply.
12. Air hoses for pneumatic tools exceeding 1/2-inch inside diameter require a safety device to reduce pressure in the event of hose failure. These devices are to be in-line and placed at the source or as close as feasible to the air source such as at the air hose bib.

57.3 Powder Actuated Tools

1. Do not use powder actuated tools unless you are trained in their use.
2. Do not use powder-actuated tools in an explosive or flammable atmosphere.
3. Before using powder-actuated tools, inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.
4. Test the tool each day before loading to verify that safety devices are in proper working condition. Test in accordance with the instructions furnished with the tool.
5. Never point powder-actuated tools at anyone.
6. Do not load the tool shall unless it is to be used immediately.
7. Never leave a loaded tool unattended.
8. Keep observers at a safe distance from the work area.
9. Do not use tools without the standard guards installed.
10. In selecting the proper power load, start with the lightest power level recommended for the tool being used. If the first test fastener does not penetrate to the desired depth, continue increasing power levels by single steps until proper penetration is obtained.
11. Do not drive fasteners into an existing hole without using a guide supplied by the manufacturer to ensure proper alignment.
12. Do not fire fasteners into very hard or brittle materials.
13. Do not drive fasteners into soft or thin materials which could be completely penetrated by the fastener unless there is a backing which would prevent penetration through the other side.
14. Do not drive fasteners closer than 1/2-inch from the edge of steel or three inches from the edge of masonry materials, except for specific applications specified by the manufacturer.
15. Do not drive fasteners into concrete unless material thickness is at least three times the fastener shank penetration.
16. Keep powder-actuated tools and power loads in a dry metal container and secured by lock and key. The container shall be painted red with white letters, and only authorized personnel shall be permitted access to it. The container shall have a label on the outside reading, *Powder-Actuated Tool* and a label instructing *For Use by Authorized Personnel Only*. A label on the inside of the container shall read *Keep Locked When Not in Use.*
17. Ensure an operator's instruction manual, a power load chart, repair tools, cleaning tools, and a Tool Inspection Record is stored in the tool container.
18. Store power loads of different power levels separately.
19. Use and dispose of cartridges in accordance with manufacturer recommendations or Safety Data Sheet.
20. Supplemental training shall be conducted if inspections, observations, or accident investigations indicate that these tools are not being properly used or maintained.

57.4 Hydraulic Tools

1. Only use an approved fire-resistant fluid hydraulic fluid hydraulic power tool.
2. Do not exceed the manufacturer's recommended safe operating pressures for hoses, valves, pipes, filters and other fittings.
3. Use an armored hose if damage to hoses is likely.
4. Do not exceed the stop limit/maximum travel range or load limits.

5. Only use tools that are inspected and have the manufacturer's load limits permanently and prominently marked on the tool.
6. When working where the tool can contact exposed, energized parts, ensure the tool is designed and maintained for such use.
7. Hydraulic systems used in conjunction with tools that may contact exposed, energized parts shall provide protection against loss of insulating value for the voltage involved due to the formation of a partial vacuum in the hydraulic line.
8. Follow all manufacturer's recommendations.
9. Load hydraulic tools in a manner to prevent slippage.
10. Apply force evenly during operations.
11. Ensure the surface/object to which force is being applied is able to withstand the force.
12. Ensure all personnel are positioned out of the line-of-fire while hydraulic tools are being operated.
13. Do not use hydraulic tools for supporting loads. Once a load is lifted, block the load immediately.
14. Release pressure before connections are broken. Do not kink hoses to relieve pressure for disconnecting.
15. Do not use any part of your body to find or stop a hydraulic leak.
16. Complete visual and operational inspections prior to use, and every 6 months at a minimum.
17. Inspect hydraulic tools subjected to abnormal loads or shock before and immediately after use.
18. Inspect hydraulic hoses prior to use.

57.5 Portable Electrical Tools and Attachments

1. Do not use portable electrical tools unless you are trained in their use.
2. Do not use portable electrically powered tools without a UL label or other label from another recognized national testing organization.
3. Visually inspect portable electrical power tools prior to use.
4. Formal inspections shall be conducted annually for continuity, terminal grounding and general overall condition. Use the annual color code prescribed in Color Coding Identification - Safety Test/Inspection of Material and Equipment section of this manual to identify inspected tools.
5. Remove defective tools from service and tag them as defective until repaired or disposed.
6. Where applicable, maximum operating speed (RPM) shall be clearly marked on the tool.
7. Protect tool cords. Never carry a tool by its service cord. Never yank the cord to disconnect it from the receptacle. Keep cords away from heat, oil, and sharp edges.
8. Disconnect tools when not in use, before servicing, and when changing accessories, such as blades, bits, and cutters.
9. Follow instructions in the user's manual for lubricating and changing accessories.
10. Do not hold a finger on the switch while carrying a plugged-in tool.
11. Keep observers at a safe distance from the work area.
12. Wear proper apparel. Do not wear loose clothing, ties, or jewelry that can become caught in moving parts.
13. Ensure the tool is in good condition and that drill bits, saw blades, etc., are securely mounted.
14. Do not use tools without the standard guards installed.
15. Check the power supply cords for damaged areas that could create electrical hazards.
16. Do not use excessive force with power tools.
17. Change positions, change tools, or take rest breaks periodically to avoid sprains and strains.
18. If a tool has a "lock on" button, disengage it before starting. Do not start the tool until at the work area and ready to begin.
19. Use portable electrical power tools that are double insulated or have a three wire grounding connectors. Double insulated tools shall be distinctively marked indicating the tool is double insulated.
20. Prior to use, inspect receptacles for damage and excessive dirt, coal dust, fly ash, or other foreign material.

21. Only use receptacles with the proper configuration to accommodate the plugs of portable electric tools.
22. Inspect service cords prior to use for damaged insulation, broken outer insulation at the plug/receptacle, and for missing ground prongs.
23. Use extension cords that are properly sized for the load likely to be imposed (e.g., larger wire size for higher amperage tools).
24. Operate electrical tools within their design limitations.
25. Store tools in a dry place when not in use.
26. Never modify the plugs on tools or extension cords.
27. Do not take or use ordinary electrical tools into potentially explosive atmospheres. Special explosion proof tools are required for this type of atmosphere.
28. Route power cords around or over traffic areas and other hazards such as oil or water.
29. When portable generators or vehicle-mounted generators are used to provide power for portable electrical power tools (as in outside locations where fixed electric power facilities are not available), the non-current carrying parts of equipment and the equipment grounding conductor terminals of the receptacles on the generator shall be bonded to the generator or vehicle frame.
30. Do not use portable electrical power tools capable of producing spark or arcing in atmospheres containing or likely to contain explosive gases or airborne coal dusts without pre-job planning to include testing for the presence of such hazards. If detected, eliminate such hazards prior to beginning operations.
31. The presence of coal and coal dust on the floors and horizontal surfaces are subject to ignition from the use of electrical tools and must be considered as hazards in job planning.
32. Ensure portable electrical power tools used in wet/damp or conductive environments, such as inside metal tanks, are grounded, protected by a GFCI, or double insulated. An alternative is to use tools rate for 50 volts or less supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

57.5.1 Drills

1. Do not use bits or attachments which are not designed for a drill. Make certain the bit or attachment is far enough into the chuck and is evenly seated in the chuck.
2. Secure the work in a vise, with a clamp, etc. **DO NOT TRY TO HOLD ANY PIECE WHILE DRILLING.** When drilling, especially in metal, center punch the hole to keep the drill from skidding on the surface.
3. Do not use excessive pressure when drilling. This can cause material and drill bit breakage and possibly flying parts and material.
4. Use a drill-limiting device such as a drill bit stop collar when drilling into objects that contain energized electrical components to prevent contact with the energized components.

57.5.2 Portable Electrical Power Saws

1. Do not use electrically powered saws unless they are equipped with a functioning constant pressure switch or control that will shut off the power when pressure is released.
2. Only use portable electrically powered saws with the operating speed etched or otherwise permanently marked.
3. Do not operate saws at a speed other than that marked on the blade.
4. Keep your off-hand well clear of the blade.
5. Do not try to support the work with your hand, knee, or any other part of your body while cutting. Properly support the work or secure it with clamps.
6. Keep the guard in place and working properly.
7. Keep electrical cords out of the path of the saw blade.
8. Use blades that are appropriate for the material being cut and replace the blades if damaged or dull.
9. Do not saw wet wood.

10. Do not use saws having a blade diameter greater than two inches unless equipped with properly functioning guards above and below the base plate or shoe.

57.6 Fabrication or Modification of Tools

1. All tools fabricated or modified by TVA for performing work shall be approved and controlled in accordance with this section.
2. The organization's work control process shall authorize existing tools fabricated or modified by TVA.
3. The organization's engineering group shall approve new tools fabricated or modified by TVA.
4. Tools are evaluated and approved for specific uses and are not to be used except for the evaluated purpose.
5. When the need is identified that requires a fabricated or modified tool, the responsible engineering organization shall be contacted to provide detailed instructions (i.e., material type, size, weld size, filler material, procedure, etc.) on TVA Form 20051, Tool Fabrication or Modification Approval. Specifications will be based on regulatory standards, national consensus standards, and TVA engineering practice.
6. The responsible engineering and/or safety organization will identify inspections and tests required, if applicable, including identification of those responsible for performance of the inspections and tests; and provide signoffs for documenting completion. Identification of inspections and tests will include any inspections and tests required on a periodic basis for the fabricated or modified tool. Preventive Maintenance (PM) will be established for all periodic inspections or tests required.
7. The responsible engineering organization shall document an engineering evaluation that includes any calculations performed and a drawing on each new fabricated or modified tool. The responsible engineering organization performing the evaluation of existing tools may use alternative methods such as strength testing in place of calculations to determine acceptability of the tool being evaluated. The method of evaluation shall be documented. Photographs and/or sketches may be used in place of drawings for existing tools.
8. For approved tools/processes, assign a unique number for tracking purposes. The number assigned must be as follows, abbreviation for organization fabricating or modifying the tool followed by the year and then a sequential number (e.g., WBN-2005-1).
9. The department performing the fabrication or modification shall permanently identify (stamp) the tool with the approval tracking number. One-time tools are not assigned a tracking number.
10. The supervisor/lead foreman of the department performing the fabrication or modification shall verify that the approval form is properly completed and signed. The original of the completed form and a digital photograph of the tool shall be forwarded to the engineering or methods and process group, a copy to the tool room/tool owner, and a copy kept with the shop order or work order.
11. If an approved process exists and the tool cannot be located, then another tool can be fabricated or modified. All instructions and inspections or tests listed on the process form are to be incorporated into the shop/work order including signoffs listed on the form. The tool number shall be established on the approval process form.
12. Tools fabricated or modified must only be used for the purpose for which they were fabricated or modified.
13. Each organization will control the storage and issue of fabricated or modified tools.

58 Transmission Safe Work Practices

Transmission Safe Work Practices (SWPs) are SWPs that apply to work in Transmission. These work practices may be found at the following links.

TRANS-SWP-18-001 General

TRANS-SWP-18.002 Transmission

TRANS-SWP-18-003 Substations and Switchyards

TRANS-SWP-18-004 Telecommunication

TRANS-SWP-18-005 Reference Manual

TRANS-SWP-18-006 Useful Safety information

TRANS-SWP-18-010 Fall Protection

59 Vehicles

1. Always operate vehicles safely and in accordance with manufacturer's recommendations.
2. Always park vehicles in a manner that will prevent undesired movement (turning wheels toward a curb, use of emergency brakes, using chocks, etc.).
3. Understand the safe operation of the vehicle.
4. Never use a cell phone while the vehicle is in motion unless using hands free mode. This includes talking, texting, or use of any applications which may be on the phone.
5. Wear seat belts when the vehicle is so equipped.
6. Only transport the number of passengers for which there are seats.
7. Secure tooling and equipment that is being transported.
8. If operating these types of vehicles on public roads, they must conform to the requirements to be on the road (lights, signals, etc). Crossing a road without lights and blinkers from one piece of property to another is permissible but shall be done with appropriate caution.
9. Never modify the vehicle from its original state unless the modification is performed by an authorized dealer.
10. Consider poor weather and the impact on the stability and ability of off-road conditions.
11. Wear PPE appropriate to the work being performed.
    u. Inspect condition of vehicles before operation and do not operate if there is any visible evidence of defects that may affect safe operation.

59.1 All Terrain Vehicles (ATVs)

1. ATVs are defined as a vehicle that travels on low pressure tires with a seat that is straddled by the operator and has handlebars for steering control.
2. Always inspect ATVs before use per the owner's manual instructions. After starting an ATV, check the following:
    a. Check the throttle, brake and shifter controls for debris and dirt and ensure they work smoothly.
    b. Bounce up and down on the ATV to check the suspension.
    c. Set and release the parking brake and ensure it holds properly.
    d. Go forward slowly. Test the steering and brakes.
3. Wear a DOT approved helmet when operating an ATV. Other PPE shall be appropriate to the work being performed and shall be determined during the pre-job brief.

4. Secure and distribute loads properly. Know the weight limits for the ATV for towing and hauling cargo.
5. Understand any site-specific hazards for ATV use on the site where it is being operated. For example, be aware of any road crossings, traffic in the area, steep slopes, or drainage ditches.
6. Always drive at a safe speed appropriate for the terrain.
7. Never allow a passenger to ride on an ATV designed for a single rider.
8. Three-wheel ATVs are not approved for use on TVA property.

59.2 Commercial Motor Vehicles

1. Operators of commercial motor vehicles must comply with TVA-TSP-18.609, Commercial Vehicle Safety.
2. Supervisors have specific responsibilities to ensure licensed, trained employees operate commercial motor vehicles. See TVA-TSP-18.609, Commercial Vehicle Safety for specific requirements.

59.3 Golf Carts

1. Never drive recklessly or joy ride.
1. Avoid distractions while operating the golf cart.
2. Keep arms, legs, and feet inside the cart while vehicle is in motion, except when signaling a turn.
3. Do not allow anyone to ride standing in the vehicle or on the back platform of the vehicle.
4. Do not put vehicle in motion until all passengers are safely seated inside vehicle.
5. Operate the vehicle from the driver's side only.
6. Check blind spots before turning.
7. Carefully turn and look behind golf cart before backing up.
8. Avoid sharp turns at maximum speed and drive straight up and down slopes to reduce the risk of passenger ejections and/or rollover.
9. Avoid excessive speed, sudden starts, stops and fast turns.

59.4 Passenger Vehicles

1. TVA and authorized contractor employees who drive vehicles for company business are required to operate them in a safe and responsible manner, in accordance with all traffic rules and regulations and manufacturer specifications.
2. All employees using a company owned vehicle will ensure that a 360° Vehicle Walk Around is conducted prior to use and upon returning to the vehicle:
3. Walk around the vehicle making sure the area to the back and sides of the vehicle are clear of obstacles. Typical obstacles can be other vehicles, pedestrians, children, poles, posts, bicycles, toys, etc., These are items that may not be visible from the cab of the vehicle or the mirrors.
4. 360° Vehicle Walk Around reminder magnets are a preferred tool to remind the driver to conduct the Walk Around. Maximo ID BMA162C should be used by sites or business units wishing to order magnets.
5. Visual vehicle checks shall be made by drivers before a vehicle is operated. The frequency of checks is dependent on the frequency of use and overall knowledge of the vehicle. The checks are used to identify damage, inoperability, or any adverse condition, which would affect the safe operation of the vehicle. These visual checks include.
    a. Gauges
    b. Wheels and tires
    c. Mirrors and mirror adjustment
    d. Windshield, including wipers
    e. Lights, including headlights and directional, hazards, and brakes
6. When moving or positioning vehicles in areas where contact with structures, other equipment, vehicles or pedestrians is likely, use a spotter if available.

7. Consider the weather forecast when planning trips.
8. Do not operate a vehicle until all windows are free of dirt, ice, snow, frost, or anything that obstructs clear vision.
9. Operate all vehicles in a safe manner, using defensive driving techniques. Do not drive aggressively.
10. Use headlights when fog is encountered or when driving in the rain.
11. Familiarize yourself with the location of vehicle controls such as light switches, windshield wipers, hazard lights and turn signals and be sure they are working properly.
12. Correct any deficiencies that could affect the safe operation of the vehicle before operation.
13. When parked, set the parking brake or otherwise secure the vehicle from movement.
14. Do not carry loose items on the front floors, front seat, rear window, or dash.
15. Tools and other injury-producing objects carried inside vehicles shall be secured or a screen shall be installed between the cargo and vehicle occupants.
16. Portable gasoline containers shall not be carried inside the passenger/driver compartment. The container must be removed from the vehicle and placed on the ground when filling.
17. Operating vehicles near energized electrical lines or equipment shall be in accordance with safety requirements for such operation.
18. Use of a seatbelt is required for the driver and each occupant of any TVA fleet, rented or privately owned motor vehicle being used for TVA business.
19. All personnel and/or passengers utilizing a TVA-owned or rented vehicle are prohibited from smoking inside the vehicle.
20. Never operate any vehicle while impaired. If involved in a motor vehicle incident, the driver may be subject to an appropriate Fitness for Duty (FFD) investigation per business unit guidelines. Examples of impairment include:
    a. Fatigue.
    b. Alcohol use.
    c. Controlled substance use, including prescription medications.
    d. Mental and/or physical condition.
21. If an employee's fitness to safely operate a vehicle for company business is called into question, the manager may revoke the employee's approval to drive until completion of a joint investigation between the business unit and human resources.
22. As a result of the investigation, re-certification or a waiver may reinstate the employee's authorization to drive. These situations are handled on a case-by-case basis at the discretion of management and in compliance with all applicable regulatory guidelines.
23. The following requirements apply to the use of cell phones and other electronic devices, i.e. navigation devices, computers, etc. while driving any vehicle on TVA business.
    a. Use of a cell phone in other than hands free mode is prohibited.
    b. The only exception is use by TVA Inspectors and other emergency personnel.
    c. Texting while operating motor vehicles is prohibited.
24. When parking a vehicle:
    a. Place automatic transmissions in park, standard transmissions in low or reverse gear.
    b. When appropriate, turn wheels into the downgrade slope of a curb.
    c. Set the parking brake and remove the keys.
    d. Use blocking or chocks when applicable.
    e. Whenever possible, do not park across from, or on a private driveway, creating an obstruction to the driveway.
    f. When avoidable, do not park company vehicles on the street overnight.
25. When parking and leaving a company vehicle (or vehicle used for company business) unattended:
    a. Always secure vehicle by closing windows, removing keys and locking vehicle doors.
    b. Secure all body bin doors, cargo boxes and toolboxes if equipped with locks.
    c. Secure or cover cargo when practical

26. When possible, vehicles shall be parked such that backing will not be required when the vehicle is moved. The goal is to make the next move forward for the vehicle.
27. If backing in, visually scan the parking spot or walk through the area. Ensure the area is completely free of hazards before entering the spot.
28. Become familiar with the use of side-mounted mirrors and the rearview mirror when backing. Learn to judge the distances on all mirrors marked “Objects may be closer than they appear.
29. Ensure backup alarms are working properly on those vehicles equipped with them.
30. Whenever possible, use an observer/signalman/flagman to assist in backing.
31. Vehicular equipment having an obstructed view to the rear may not be operated in reverse unless:
    a. There is no person(s) exposed to the hazards created by the moving vehicle.
    b. The vehicle has a reverse signal alarm audible above the surrounding noise level.
    c. A designated employee signals that it is safe to do so.
    d. When the vehicle is backing up, the vehicle’s horn should be used to alert the surrounding area to the backing.
32. When backing out of a perpendicular spot, slowly back out until you can safely see both directions are clear.
33. Keep the volume of radio and other audio devices turned off or low until you are out of the parking spot. This may enhance your ability to hear car horns or engines as you pull out.
34. Passengers should assist in spotting vehicles or other obstructions.
35. In case of any vehicle trouble (e.g., a flat tire), pull off to the right side of the road, if possible, and use emergency flashers and warning signals.
36. In case of an accident:
    a. Stop the vehicle immediately or as near to the accident as practical.
    b. Put on a traffic vest if one is available.
    c. Give assistance and obtain medical first aid if necessary.
    d. Call the control room for emergencies on generation plant property. Dial 911 or a local emergency number to report serious emergencies for off TVA site events.
    e. Notify supervisor as soon as possible. The supervisor must complete vehicle incident report using the Vehicle Reporting Link found in Medgate.
    f. Exchange names, addresses, and vehicle insurance information.
    g. Do not discuss who is at fault.
    h. Get names of any witnesses to the accident
    i. Remain at the scene until you are no longer needed.
37. For roadside assistance of a company vehicle, call the emergency number provided by Fleet Services: 1-800-227-2273 (1-800-Car-Care).
38. Authorized drivers must inform the appropriate manager if driving privileges have been revoked.no later than the next business day after returning to work.
39. While driving on company business, an employee must:
    a. Comply with all vehicle policies, qualifications and procedures identified in this document.
    b. Notify supervision of any physical, mental disability or condition that affects the employee’s fitness to drive.
    c. Notify supervision of any issue regarding drugs or medication the employee is taking that may cause drowsiness or impairment while driving.
    d. Report vehicle accidents to supervision immediately.
    e. Ensure the vehicle checks have been performed and the vehicle is believed to be roadworthy.
    f. Respond to traffic violations and pay any fines assessed.
40. An employee may refuse to drive for reasons of unacceptable risk, which include:
    a. Unsafe vehicle conditions as identified by visual inspection that warrant immediate repairs.
    b. Severe driving conditions (e.g., weather, visibility, road conditions).

   c. Physical conditions limiting or influencing safe vehicle operation performance (e.g., fatigue, prescribed medications, illness/disease, or temporary or permanent handicap).
41. A refusal to drive must be documented, including any resulting actions. It is essential that employees report to their manager all conditions that may result in reduced vehicle safety as unacceptable risks. The manager and employee review of the identified driving risk is intended to provide solutions for reducing or eliminating the driving hazards including, but not limited to, not driving.
42. Management may assign the Defensive Driver Online Course (LMS 00081135) for those employees who drive excessive miles, receive a traffic violation, or are involved in at-fault accident.

59.5 Utility Task Vehicles (UTVs)

UTVs may also referred to as a side by side and is generally a two-to-six-person vehicle intended for carrying out a specific task. Name brands include John Deere Gators, Kubotas, and Polaris Razors.

1. Wear a helmet when navigating terrain that is unusually rough or poses a risk for roll over.
2. Keep legs and arms inside the vehicle at all times.
3. Drive slowly and turn smoothly to avoid an overturn.
4. Drive completely up or down a slope or hill before making a turn. Do not turn the vehicle in mid-slope or hill as this increases the probability of overturning.
5. Use the appropriate speed on rough terrain.
6. Stay clear of ditches and embankments.
7. Each passenger must ride in his/her own seat, not anywhere else on the UTV.
8. Secure and distribute loads properly. Know the weight limits for the UTV for cargo.
9. Be sure to tow load at a speed slow enough to maintain control. Remember, the stopping distance increases with speed and weight of a towed load. Follow the manufacturer's recommendations for weight limits for towed equipment.

60 Walking/Working Surfaces

This section addresses both routine (sidewalks, designated walkways, work platforms, etc.) and non routine (piping, equipment, ductwork, etc.) walking and working surfaces.

1. All walking and working surfaces bus provide safe access to the work. If access is not clear and safe, use scaffolds, work platforms, ladders, etc. to gain safe access.
2. Report deficiencies in walking/working surfaces. If necessary, mark or barricade any trip hazards until they can be corrected.
3. Practice good housekeeping. Keep walking and working surfaces clean and free of debris and trip hazards.
4. Do not run cords, hoses, etc. across areas where personnel are expected to be walking or working. Cords and leads shall be run overhead at a height not less than 7’-6”. If this is not possible, consider the following options or other means to protect the cords and eliminate tripping hazards:
   a. Run the cords in low traffic areas such as along the edge of the wall or underneath tables.
   b. Use a cord strip protector or secure the cord to the floor with tape
5. When working from a non routine walking or working surface such as equipment, special considerations are necessary.
   a. Ensure the surface will support the intended loads (workers, tools, equipment). Do not rely on appearance or assumptions. Contact engineering for support if necessary.
   b. Inspect the surface for deficiencies, degradation or structural concerns. Address any identified deficiencies before proceeding with the work.
6. Piping, duct work, equipment covers and other non routine walking and working surfaces are generally protecting an energized source. Ensure the equipment is deenergized or you are otherwise protected from the energy source before beginning work.

7. Implement fall prevention when:
    a. Fall potential exists that is greater than 4 feet to the surface below.
    b. There is a potential to fall any distance onto dangerous or energized equipment such as conveyors or bus work.
    c. There is a potential to fall into any other hazardous condition such as hazardous liquids or surfaces containing impalement hazards.
    d. Do not stand on piping, ductwork, etc., without ensuring the load can be supported and insulation will not be damaged.

61 Weather

For warm weather and heat conditions, refer to the Heat Stress Section of this manual and follow TVA-TSP-18.906, Heat Stress. Although the following weather hazards are not regulated by OSHA, the information below provides safety guidance for mitigating weather hazards.

61.1 Cold Temperatures

1. Wear proper clothing that insulates from the cold and allows perspiration to evaporate.
2. Protect feet and toes. Two layers of socks are recommended with boots with ankle protection.
3. Wear proper hand protection. Add glove liners for extra warmth,
4. Use hand warmers in pockets and foot warmers in boots in extreme cold.
5. Stay well hydrated. Drink plenty of fluids.
6. Remember that hypothermia can occur at cool temperatures, especially if you are sweating and the perspiration is not evaporating.
7. Take breaks to warm up.
8. Stay dry. In wet conditions, wear rain gear and change wet clothing frequently.
9. When work must occur for an extended period of time, consider using portable shelters and temporary heat sources.

61.2 Lightning

OSHA has issued a fact sheet regarding lightning safety when working outdoors which may be accessed at https://www.osha.gov/Publications/OSHA3863.pdf. The following information can be used to avoid injury when lightning is present.

1. Check weather reports when planning work outdoors. Consider rescheduling jobs when storms are expected.
2. Regularly monitor weather conditions. Watch for darkening clouds and increased wind speeds.
3. Seek shelter immediately when you hear thunder. Do not depend on seeing lightning or rainfall being present. Lightning is unpredictable and can strike outside of rainfall areas.
4. Seek shelter in buildings and remain in shelter for at least 30 minutes after hearing the last sound of thunder or until it has been verified there has been no lightning within 10 miles of the work area for at least 30 minutes. Mobile applications such as My Lightning Tracker and weather websites such as lightningmaps.org may be used as a tool to determine when lightning is present in the area.
5. If buildings are not available, shelter in a vehicle with the windows rolled up. Avoid contact with controls and metal surfaces.
6. Do not go back outside too soon after a storm has passed, or the last strike has been observed.
7. Never work from scaffolds, cranes or on top of walls during storms or high winds.