Environment, Health and Safety Technical Guideline

TG-07

Construction, Operations and Maintenance Safety

Produced by

Environment & Safety Office – Campus Facilities Department

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Appendices

1 Purpose

The purpose of this document is to protect the health and well-being of all employees, students, contractors and visitors to Qatar University (QU) associated with operations and maintenance activities, as well as protecting QU property and the environment by functions by:

- preventing operations and maintenance-related accidents and injuries;
- assuring all QU employees, students, contractors and visitors clearly understand operations and maintenance-related risks;
- reducing, controlling, or avoiding personnel exposure to all known or suspected occupational health and safety risks;
- instituting adequate procedures to protect all property and the environment from damage and loss; and
- requiring all QU employees, students, contractors and visitors to be in compliance with all operations and maintenance-related safety regulations and procedures.

2 Scope

This EHS Technical Guideline applies to all operations and maintenance activities that may affect QU employees, students, contractors and visitors.

This EHS Technical Guideline presents the minimum level of acceptable EHS practices and requirements that are expected from all individuals (faculty, staff, and contractors) involved in the operations and maintenance of QU equipment and facilities.

3 Responsibilities

3.1 Top Management

QU top management shall allocate sufficient resources for the effective implementation of the EHSMS, including the application of this EHS Technical Guideline, and ensure that QU employees, students, contractors and visitors are aware of their responsibilities through appropriate regulation, delegation and communication.

The QU Top Management is also accountable for monitoring and reporting EHS performance and appropriate programs and actions to ensure compliance with the QU EHS Policy.

3.2 Other Accountabilities

The QU Environment and Safety Office (ESO) and the EHS Committee are accountable to the QU Top Management for the implementation of this EHS Technical Guideline.

Vice Presidents (VP), Associate Vice Presidents (AVP), Deans, Directors, Managers, Head Sections/Units and Project Managers are accountable to the QU Top Management for the application of this EHS Technical Guideline in areas under their supervision.

All QU staff and students are responsible for performing their duties in compliance with the requirements of this EHS Technical Guideline as it applies to their activities, and promptly reporting all hazards, incidents and accidents to their supervisors.

All QU contractors are responsible for performing their duties in compliance with the requirements of this EHS Technical Guideline as it applies to their activities, and promptly reporting all hazards, incidents and accidents to their QU supervisors. EHS aspects of the selection and management of contractors performing operations and maintenance tasks will be in accordance with QU **EHSMS Section 7.0 – Contractor Management.**

4 Guidelines

4.1 Hazard Identification and Risk Management

Identification, assessment, control, and monitoring of EHS risks will be applied in accordance with QU **EHSMS Section 6.0 – Risk Management Procedure**.

EHS Hazards and Risks related to operations and maintenance-related activities are detailed in the Occupational Health and Safety Risk Register, and the Environmental Impacts Register for specific facilities.

Any emerging EHS hazards will be reported to supervisors and the Environment and Safety Office in accordance with QU **EHSMS Section 12.0 – Hazard, Near-Miss, Incident Reporting and Investigation**.

4.2 Personal Protective Equipment

All QU staff performing operations or maintenance activities shall wear appropriate Personal Protective Equipment when undertaking such tasks. Guidelines on Personal Protective Equipment requirements and use are presented in the following sections.

Contractors performing operations or maintenance activities are also required to wear appropriate Personal Protective Equipment when undertaking such tasks. Provision for new or additional Personal Protective Equipment shall be the responsibility of the contractor. QU Environment and Safety Office (ESO) and QU contract managers have the right to require the contractor/s to issue/ re-issue new Personal Protective Equipment if it is deemed necessary due to work requirements.

4.2.1. Head Protection

- Personnel must wear protective helmets when working in areas where there is a potential for injury to the head from staff initiated impact or impact from falling or other moving objects. These areas include but are not limited to: construction sites, central service unit, energy center, chiller plants (including but not limited to Food court, women's sports center, men & women's activity center), and areas where working requires lifting and/or excavation.
- Protective helmets designed to reduce electrical shock hazards will be worn by each worker when exposed near electrical conductors which could contact the head. Helmets will comply with ANSI Z89.1-1986 or be equally effective.
- Class C head protection shall be used for protection from minor scalp abrasion and minor bump hazards. Class B head protection shall be used for electrical hazard. Class G (formerly known as class A) head protection shall be used for construction.
- Head protection shall be replaced if cranked, chopped, dropped with significant force or otherwise damaged.
- Personnel shall not paint or deface hard hat or bump cap.
- Personnel shall be issued one head protection according to usage.

4.2.2. Eye and Face Protection.

- Use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.
- Eye and Face PPE must comply with ANSI Z87.1-1989 or be demonstrated to be equally effective.
- Contractors/ workers shall wear approved eye protection at work site where protection to the eyes is needed (e.g. welding, grinding, cooling tower monitoring, laboratory analysis, chipping, polishing, lathe turning work).
- Safety glasses shall be furnished by contractor to his/her staff.
- Eye and face protection that are already blurred and damaged shall be replaced immediately.
- Eye and Face Protection shall comply with Occupational Safety and Health Standard 1910.133 and passed ANSI Z87.1-1989 and/or EN-166.

4.2.2.1. Safety Glasses

- Do not use ordinary prescription as they do not provide adequate protection from injury to the eyes.
- Use hardened-glass or plastic spectacles with side shield.

- Safety glasses used must comply with the Standard for Occupational and Educational Eye and Face Protection (Z87.1).
- Wearing of contact lenses is allowable provided only if wearing additional eye protection, unless otherwise restricted by the activity's nature.

4.2.2.2. Goggles

- Wear goggles when there is a hazard from splashing chemicals or flying particles, e. g. when using glassware under reduced or elevated pressure, or using glass apparatus in combustion or other high temperature operations.

4.2.2.3. Face Shields

- Wear face shield when there is a need for greater protection from flying particles and harmful liquids to protect face and neck.
- Consider using a face shield when operating a vacuum system (which may implode), or conducting a reaction with potential for mild explosions.

4.2.3. Hand Protection.

- Use appropriate hand protection when their hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns and harmful temperature extremes.
- Supervisors must base the selection of hand protection on evaluation of the performance characteristics of the hand protection relative to the specific tasks to be performed, conditions present, duration of use and the hazards and potential hazards identified.
- Personnel shall wear hand protection when exposed to potential hand injuries and minimize exposure to hazards such as chemical absorption through the skin, severe lacerations or cut, punctures and chemical or thermal burn.
- Personnel shall use protective leather gloves for cutting and welding work.
- The Material Safety Data Sheet shall be used to determine the appropriate gloves to be used during handling of chemicals.
- Personnel working with rigging wire and chains shall use cotton work gloves.
- Personnel shall maintain (clean, safe keep) the hand protection equipment to maximize useful life.
- Hand Protection shall comply with Occupational Health and Safety Standard 1910.138 and passed European Standard EN-388.

4.2.3.1. Gloves

- Wear proper protective gloves for potential contact with corrosive or toxic material, materials of unknown toxicity, sharp edged object, and very hot or cold materials.

- Select gloves based on material handled, the particular hazard involved and their suitability for the operation conducted.
- Consider double gloving (the wearing of two gloves on each hand) when handling highly toxic or carcinogenic materials.
- Before each use, inspect gloves for discoloration, punctures and tears.
- Before removal, wash gloves if the material is impermeable to water.
- Do not reuse single-use disposable gloves.
- Store gloves properly.
- Dispose gloves if already old; shelf life is stamped on the box.
- Dispose contaminated gloves in the proper waste bin.
- Do not wear gloves outside the working area as this may contaminate surface if touch such as doorknobs, elevator buttons or rest fixtures.
- Do not use gloves containing asbestos
- For high temperature operations, use gloves made of synthetic material such as Kevlar.

4.2.3.2. Electrical Gloves

- Defective insulating gloves shall not be used.
- Insulating gloves with the following defects shall not be worn: holes; tears; punctures or cuts; imbedded foreign objects; texture changes such as swelling, hardening or becoming stick or inflexible.
- Rubber insulating gloves that have been used without protectors shall not be used without protective gloves.
- Protective gloves shall not be used if they have holes, tears or other defects that affect their ability to give mechanical protection to the insulating glove.
- Protective gloves shall not be used if they have holes, tears or other defects that affect their ability to give mechanical protection to the insulating glove.
- Protective gloves that have been used for any other purpose shall not be used to protect insulating gloves.
- Gloves that have been rejected and are not suitable for electrical services shall have the fingers removed and the gloves disposed.
- Rubber gloves and protective gloves which have oil, grease or other damaging substance on them, shall be cleaned properly before use.
- Rubber gloves shall be turned inside out and rinsed as necessary to remove perspiration. Excess water shall be removed by shaking and the gloves shall be air-dried.
- Insulating gloves shall be visually inspected by the wearer for defects. Before using, visually inspect the glove especially around the fingers to detect cracks or deterioration.
- Insulating gloves shall be given an air test by rolling the cuffs tightly toward the palm in such a manner that air is trapped inside the gloves or by using a

mechanical inflator. When using the latter care shall be taken to avoid over-inflation.

- Gloves shall be air tested each day before use and time there is cause to suspect damage.
- A periodic inspection of the gloves shall be conducted by the Electrical Engineer to determine that such equipment is being maintained in a satisfactory condition by the user.
- Gloves shall be stored in a designated location (e.g. tool room) as cool, dark and dry as possible with no other material or equipment nearby that could cause damage.
- Gloves when not in use must be inside the protectors and in a bag, box or container designed for and used exclusively for them. These gloves shall be stored in their natural shape.
- The protector gloves shall be sized and shaped so the insulating gloves shall not be deformed from their natural shape.
- Electrical gloves shall comply with Occupational Health and Safety Standard 1910.137.

4.2.4. Protective Apparel / Coverall (Long Sleeve)

- Coverall or protective aprons shall be worn at all times while working.
- Wearing loose clothes (e.g. saris, dangling neckties, oversized or ragged coats) in the working area is prohibited.
- It is strictly prohibited to strap the coverall in the waist line portion of the body as this does not served the purpose of protecting the upper half portion of the body.
- Coveralls shall be worn during operation, maintenance of equipment. Shirt and pants shall be worn for other operational duties and light maintenance.
- Trouser legs shall not be rolled above the ankles and shirttails shall be tacked in one's pants.
- Clothing saturated with oil shall be removed as soon as practical and the affected part of the body shall be washed with soap and water.
- Only clean clothing in good condition (free of tears, frays, rips and patches) shall be worn during work.
- Finger rings, watches, bracelets and other jewelry shall be removed while performing maintenance work.
- Wear coveralls under welding aprons and chaps during welding work. Button coveralls to the neck and button pockets to prevent sparks and slag from burning the skin. Do not use clothing to clean torch tips.
- Coveralls shall be worn by contractors at all times during their work at QU.

4.2.5. Respiratory Protection

- Personnel will wear appropriate respiratory protection when adequate ventilation or substitution with non-toxic chemicals, etc., is not possible or feasible or as deemed necessary by the EHS risk assessment. Respirator protection must comply with ANSI Z288.2.
- Respiratory protection is necessary when working with highly toxic chemicals, biological hazards, or dust known to cause asthma or pulmonary fibrosis. However, respirators are a “last line” of defense, and should not be used until all engineering controls (e.g. ventilation) and work practice controls are exhausted.
- Respirators to be used shall comply with Respiratory Protection Standard OSHA 29 CFR 1910.134.
- Do not use dust/comfort masks or surgical masks.
- Respirator shall be used during construction where dust accumulation is very heavy.
- Respiratory protection shall be used in confined spaces as deemed by the activity specific EHS risk assessment.
- Refer to Material Safety Data Sheet (MSDS) for proper selection of respirators.
- Respirator fit shall be conducted annually for staff required to wear respirator.
- Staff with facial hair shall not be given mask respirator as gases/fumes will still penetrate the sealing surface of the respirator.
- Contact lenses shall not be used with respirators.
- Respirator shall be inspected before and after use by staff for tightness of connections; condition of face piece; head band; valves and connecting tubes, pliability and signs of deterioration of rubber parts; proper air pressure and proper functioning.
- Clean and disinfect equipment after each use according to manufacturer recommendation.
- Positive pressure respirator shall be serviced only by a qualified person using parts designed for the particular respirator.
- Respirator shall be stored where they are protected from dust, sunlight, heat, extreme cold, excessive moisture and damaging chemicals. Store respirator with the face piece and exhalation valve resting in a normal position to prevent distortion. Do not store respirator in places, such as lockers or toolboxes, unless they are in carrying cases or cartons supplied by the manufacturer.
- Chemical cartridges shall be replaced as necessary to provide complete protection.
- Replacement of cartridge shall be installed by experienced personnel. Change a defective respirator for a new one.
- Respirator located at stations and work areas for emergency use shall be readily accessible at all times. They shall be stored in a specially designed compartment.
- Respirator shall comply with Occupational Safety and Health Standard 1910.134

4.2.6. Fall Protection.

Note: For detailed safety requirements related to any work at heights, refer to **SOP 06 – Working at height.**

- Fall protection must be provided when staff are exposed to:
  - a vertical fall of 1.8 meters or more over a lower level; or
  - any height over dangerous equipment.
- Fall protection will consist of either passive or active fall protection. Fall protection must comply with ANSI A10.14-1991.
- Safety harness shall be worn at all times while working above 1.8 meters or more above ground unless other adequate protection against falling is provided.
- All safety harness shall be regularly inspected for excessive wear or damage that could cause them to fail. Harnesses and lanyards that are worn or damaged to the extent that they could fail shall be discarded and not be used.
- Safety harness or lanyards shall be a minimum of 13 mm nylon or the equivalent, with a maximum length of 1.8 meter. They shall have a minimum breaking strength of 2,700 kg.
- The use of shock absorbing lanyard shall consider the total length of the lanyard in consideration of the height of work.
- The use of double lanyard safety harness is mandatory if there is a necessity for the worker to remove his lanyard in order to move.
- Lifelines shall be a minimum of 20 mm, or equivalent, with a minimum breaking strength of 2,700 kg. Steel cables are recommended for horizontal anchor lines with a minimum breaking strength of 2,700 kg or five times the load.
- Fall protection equipment shall comply with Occupational Health and Safety Standard 1926.104 and passed European Standard EN-361, EN-354, EN-355, EN-353-2 and EN-362.

4.2.7. Foot Protection

- Personnel must wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or from object piercing the sole, and where staff feet are exposed to electrical hazards. PPE for foot protection must comply with ANSI Z41.1991 or be equally effective.
- Workers shall wear employer issued safety shoes at work site at all times. Exceptions are as follows: offices, meeting rooms, change rooms. Avoid borrowing safety shoes.
- Personnel shall wear protective footwear when working in areas where there is danger of foot injuries due to falling or rolling piercing the sole, or where the feet are exposed to electrical or chemical hazards.

- Shoes with toe or metal guards, oil and chemical resistant sole shall be used as foot protection.
- If safety shoes are inadvertently destroyed as a result of assigned duties (but not caused by staff negligence) safety shoes shall be replaced at company's expense.
- Contractors working inside QU premises shall wear foot protection, provided by the contractors.
- Visitors shall wear foot protection at areas that require safety shoes and shall be provided by the QU and/ or contractors.
- Safety shoes shall comply with Occupational Health and Safety Standard 1910.136 and passed ANSI Z41-1991 and/or European Standard EN-345.

4.2.8. Electrical Protection

- Electrical protective equipment such as insulating blankets, mating, covers, line hoses, gloves, gloves and sleeves must be provided to personnel who are exposed to electrical hazards.

4.3 Electrical Safety

SOP-02: Electrical Safety provides detailed safety requirements that apply to all operations and maintenance activities at QU. This SOP must be strictly adhered to when conducting all such operations and maintenance activities.

4.3.1. Lock Out / Tag Out

Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment could expose workers to the unexpected energization or startup of the equipment or release of hazardous energy unless proper precautions are taken.

SOP-01: Lockout / Tagout provides detailed safety procedures pertaining to the lockout / tagout program to control hazardous energy and protect personnel. This SOP must be strictly adhered to in when performing all operations and maintenance activities at QU.

4.4 Hot Work

All hot work activities shall be managed under a Permit to Work (refer to *QU EHSMS Section 7.1 PTW procedure*) to protect personnel and property from a fire caused by hot work. The permitting system defines the responsibilities and requirements for performing hot work and establishes controls through the use of a permit.

This system establishes the means to assess the work area and the planned hot work activity to ensure sufficient and necessary controls are in place to prevent a fire.

Hot work will only be performed in areas that are or have been made fire safe. Where fire prevention precautions, such as a fire suppression system or a fire or smoke detection system, are not sufficient a fire watch person shall be assigned to monitor the area for fire, as needed.

4.4.1. Scope

This procedure applies to all hot work performed on QU property, including work performed by QU staff and contractors. Hot work includes any temporary operation, scheduled or emergency, indoor or outdoor, involving open flames or producing heat and/or sparks.

Hot work activities includes, but is not limited to:

- Torch cutting,
- Welding, soldering,
- Brazing, and
- Grinding.

Permanent areas which are designated areas for long term or permanent performance of hot work, such as a maintenance shop or a detached outside location are not considered hot work as defined above.

A PTW is **not** required for:

- Operations performed that do not generate sufficient heat or sparks to be considered a significant source of ignition to surrounding combustibles.
- Operations performed in permanent areas, which are designated areas for long term or permanent performance of hot work, such as a maintenance shop or a detached outside location.
- Permanent areas where welding, torching, or cutting will be performed must have the following conditions to be exempt from this procedure:
  - Areas constructed of non-combustible or fire resistive material.
  - Areas essentially free of combustible and flammable content.
  - Areas suitably segregated from adjacent areas.
  - Areas equipped with a suitable exhaust system capable of removing the fumes and spent gases associated with Hot Work.

4.4.2. Precautions and Requirements

- A PTW must be completed and approved prior to initiating hot work and posted at the work area. The QU PTW is found in *QU EHSMS Section 7.1 PTW procedure*.

- The work process shall include (1) an assessment of the facility condition, (2) preparation of the work area, (3) hot work activity, (4) closeout.
- Hot Work is permitted only in areas that are or have been made fire safe.
- Hot Work equipment shall be in good working condition and fully inspected.
- A hazard assessment of the scheduled hot work in the work area shall be required, where the following conditions exist:
    - Fire suppression system is not operable or does not exist.
    - Fire/smoke detection system is localized only or does not exist.
    - Special potential hazards such as work in a confined area, attic, or crawlspace in which an increased fire risk may exist.
    - The floor around the area where the hot work is to be performed shall be swept clean and clear of debris for a radius of 35 feet.
    - Combustibles shall be adequately protected or shielded, using flameproof materials. For torch cutting or welding, combustibles shall be relocated at least 35 ft horizontally from the work area. The edges of covers at the floor shall be tight to prevent sparks from going under the covers.
    - Openings or cracks in walls, floors, or ducts within 35 feet of the site shall be tightly covered to prevent the passage of sparks to adjacent areas.
    - When torch cutting or welding is performed near combustible partitions or ceilings, fire resistant guards shall be provided to prevent ignition.
    - Welding shall not be attempted on a metal partition, wall, ceiling, or roof having a combustible covering. Oil based paints and epoxies shall be no closer than three feet in any direction.
    - Fully charged and operable fire extinguishers shall be available in the hot work area. The use of wall mounted fire extinguishers, provided in the facility, is prohibited. Available portable fire extinguishers shall include as a minimum, one 4 Kg (10 lbs) ABC rated extinguisher within 40 feet of the activity.
    - Special precautions shall be taken to avoid accidental operation of automatic fire detection or suppression systems. If the possibility exists that automatic fire detection or suppression systems will be activated as a result of the work activities, then the automatic fire detection or suppression systems shall be isolated from the detectors located in the immediate area.
    - Nearby personnel shall be relocated or suitably protected from heat, sparks, slag and arc.

4.5 Safe Lifting and Back Safety

Workers shall follow the proper safe lifting methods to prevent back injury during lifting of materials.

- Avoid the following:
  - Heavy lifting especially repetitive lifting over a long period of time.
  - Twisting at the waist while lifting or holding a heavy load, this frequently happens when using a shovel.
  - Reaching and lifting over your head, across over your head, across a table, or out the back of a truck.
  - Lifting or carrying objects with awkward or odd shapes.
  - Sitting or standing too long in one position, sitting can be very hard on the lower back.
- Place objects up off the floor to minimize the distance where the load has to travel, and allow the person to have a better grip on the object.
- Raise / lower shelves to a height that is most efficient for the workers.
- Use carts, where appropriate.
- Test the weight of an object before lifting by picking up a corner.
- Wear Back Support if necessary.
- Get help if it is too heavy for you to lift it alone.
- Use the following steps when lifting:
  - Take a balanced stance, feet shoulder-width apart.
  - Squat down to lift, get as close as you can.
  - Get a secure grip; hug the load.
  - Lift gradually using your legs, keep load close to you, keep back and neck straight.
  - Once standing, change directions by pointing your feet and turn your whole body. Avoid twisting at your waist.
  - To put load down. Use the above process in reverse.
- Use cranes, hoist, forklift, lift tables and other lift-assist devices for lifting heavy objects (e.g. pump, motor, pipes).
- Exercise regularly.

4.6 Working at height

SOP-06: Working at Height provides detailed safety requirements that apply to all QU activities performed at heights, including those associated with operations and maintenance activities. This SOP must be strictly adhered to when performing operations and maintenance activities.

This SOP includes requirements related to scaffolding, ladders, mobile platforms, working on roofs, and working above dangerous equipment.

4.7 Walking / Working Surfaces, Floor Openings

4.7.1. Walking / Working Surfaces

- All shop areas, utility rooms, halls, and storerooms shall be kept clean and orderly.
- All floors shall be kept clean and dry as possible.
- Aisles used by material handling equipment shall be appropriately marked on the floor.
- Aisles, passageways and floors shall be kept free of any obstructions such as protruding rails, splinters, holes or loose boards.
- Covers or guardrails shall be provided to protect staff from open holes, ditches, etc.

4.7.2. Guarding Floor Openings, Wall Openings & Holes

- A floor opening is any opening measuring at least 12 inches (30.48 cm) or more in any floor, roof, or platform through which a person may fall.
- Every stairway floor opening shall be guarded by a standard railing. All exposed sides (except entrance) shall be guarded.
- All ladder-way floor openings shall be guarded by a railing with toe boards and a swinging gate.
- Every hatchway and chute floor opening shall be guarded by either a hinged floor opening with standard railing or a removable railing with toe board on two sides and fixed railings opening with standard railing or a removable railing with toe board on two sides and fixed railings with toe boards on all other exposed sides.
- All pit and trap door openings infrequently used when the cover is not in place shall either be constantly attended by a member of staff or protected on all exposed sides by removable railings.
- Every temporary floor opening including manholes, when the cover is not in place, shall be constantly attended by staff until the work requiring the opening has ended or protected by removable railings and warning signs if posting of a staff is ineffective or not feasible.

4.7.3. Wall Openings

- All wall openings where there is a drop of more than 4 feet (1.22 meters) shall be protected by a rail, roller, picket fence, half door or equivalent barrier.
- Every temporary wall opening shall have adequate guards.

4.7.4. Open Sided Floors, Platforms and Runways

- Every open sided floor or platform 4 feet (1.22 meters) or more above the adjacent floor or ground level shall be guarded by standard railings.
- Toe boards shall be provided when staff can pass beneath the open sides or falling materials could cause a hazard.

4.8 Safe Use of Tools and Equipment

Note: further safety information related to machinery operation is presented in **EHS Technical Guideline TG-04 – Machine Safety.**

Personnel using hand or power tools shall apply the following safety practices.

- Select the right tool for the job. Examples of unsafe practices are: striking hardened faces of hand tools together (such as using a carpenter's hammer to strike another hammer, hatchet, or metal chisel), using a file for a pry, a wrench for a hammer, and pliers instead of the proper wrench.
- Keep tools in good condition. Wrenches with cracked work jaws, screw drivers with broken points or broken handles, hammers with loose heads, dull saws, and extension cords or electric tools with broken plugs, improper or removed grounding lugs, or split insulation are examples of tools in poor conditions. Tools that have deteriorated in this manner must be taken out of service.
- Use tools in the right way. Screw drivers applied to objects held in the hand, knives pulled toward the body, and failure to ground electrical equipment are common causes of accidents.
- Keep tools in a safe place. Many accidents have been caused by tools falling from overhead and by knives, chisels, and other sharp tools carried in pockets or left in tool boxes with cutting edges exposed.
- Apply the following to prevent tool-related accidents:
  - Supervisors are to ensure that staff are trained to select the right tools for each job.
  - Tools shall be inspected prior to use.
  - Proper storage shall be provided for all tools, in the tool room and/or on the job.
- Personnel shall never carry tools, which in any way may interfere with his/her using both hands freely on a ladder or while climbing on a structure. A strong bag, bucket, or similar container is to be used to hoist tools from the ground to the job. Tools are to be returned in the same manner, not brought down by hand, carried in pockets or dropped to the ground.
- Mislaid and loose tools cause a substantial portion of hand tool injuries. Tools should not be left where personnel are moving or walking.

- Chisels, screwdrivers, and pointed tools shall never be carried in a worker's pocket. They are to be carried in a tool box or cart, in a carrying belt (sharp or pointed end down) like those used by electricians and steel workers, in a pocket tool pouch, or in the hand with points and cutting edges pointing away from the body.
- Personnel carrying tools on their shoulders should pay close attention to clearances when turning around and should handle the tools so that they will not strike other staff.
- Appropriate personal protective equipment, e.g. safety goggles, gloves, etc. should be worn due to hazards that may be encountered while using portable power tools and hand tools.
- Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive and splashing objects, or exposed to harmful dusts, fumes, vapors, or gases are to be provided with the particular personal protective equipment necessary to protect them from the hazard.
- Practices require to be applied by personnel when using specific tools are detailed in the following sections.

Should an EHS risk assessment be required for a new or existing tool or piece of equipment (for example where safety hazards or concerns have been identified), a Work Equipment inspection can be conducted using the checklist in *Appendix A*.

4.8.1. Metal Cutting Hand Tools

Chisels

- Factors determining the selection of cold chisels are the materials to be cut, the size and shape of the tool, and the depth of the cut to be made.
- The chisel should be made heavy enough so that they will not buckle or spring when struck.
- A chisel no larger than the job should be selected so that the blade is used rather than the point or corner. Also, a hammer heavy enough to do the job should be used.
- Personnel shall wear safety goggles when using a chisel and should set up a shield or screen to prevent injury to other workers from flying chips. If a shield does not afford positive protection to all exposed staff, then glasses with side protection should be worn.

Tap and Die Work

- The work should be firmly mounted in the vice. Only a T-handle wrench or adjustable tap wrench should be used. When threads are being cut with a hand die, hands and arms should be kept clear of the sharp threads coming through the die, and metal cuttings should be cleared away with a brush

Hack Saws

- Hacksaws should be adjusted in the frame to prevent buckling and breaking, but should not be tight enough to break off the pins that support the blade. Install blade with teeth pointing forward.
- Pressure should be applied on the forward stroke not on the back stroke. If the blade is twisted or too much pressure is applied, the blade may break and cause injury to the hands or arms of the user.

Files

- Selection of the right kind of file for the job will prevent injuries and lengthen the life of the file. Inasmuch as the extremely hard and brittle steel of the file chips easily, the file should never be cleaned by being struck against a vice or other metal object. A file-cleaning card or brush should be used.
- For the same reason, a file is not to be hammered or used as a pry. Such abuse frequently results in the file's chipping or breaking causing injury to the user. A file should not be made into a center punch, chisel, or any other type of tool because the hardened steel may fracture in use.
- A file is never to be used without a smooth, crack-free handle; if the file should bind, the tang may puncture the palm of the hand, the wrist, or other part of the body. Under some conditions, a clamp-on raised offset handle may be useful to give extra clearance for the hands. Files are not to be used on lathe stock turning at high speed (faster than three turns per file stroke) because the end of the file may strike the chuck, dog, or face plate and throw the file (or metal chip) back at the operator hard enough to inflict serious injury.

Tin Snips

- Tin snips should be heavy enough to cut the material so easily that the worker needs only one hand on the snips and can use the other to hold the material. The material is to be well supported before the last cut is made so that cut edges do not press against the hands.
- Jaws of snips are to be kept tight and well lubricated.
- Staff and contractors shall wear safety goggles when trimming corners or slivers of metal because small particles often fly with considerable force. They shall always wear gloves.

Cutters

- Cutters used on wire, reinforcing rods, or bolts should have ample capacity for the stock; otherwise, the jaws may be sprung or spread. Also, a chip may fly from the cutting edge and injure the user.
- Cutters require frequent lubrication. To keep cutting edges from becoming nicked or chipped, cutters are not to be used as nail pullers or pry bars.

- Cutter jaws should have the hardness specified by the manufacturer for the particular kind of material to be cut. By adjustment of the bumper stop behind the jaws, cutting edges are to be set to have a clearance of 0.003 inch when closed.

4.8.2. Wood Cutting Tools

Note: Edged tools are to be used so that if a slip should occur, the direction of force will be away from the body. For efficient and safe work, edged tools are to be kept sharp and ground to the proper angle. A dull tool does a poor job and may stick or bind.

Chisels

- Inexperienced staff and contractors shall be instructed in the proper method of holding and using chisels. Handles are to be free of splinters.
- The wood handle of a chisel struck by a mallet is to be protected by a metal or leather cap to prevent it from splitting.
- The work to be cut must be free of nails to avoid damage to the blade or cause a chip to fly into the user's face or eye.

Saws

- Saws should be carefully selected for the work they are to do. For crosscut work on green wood, a coarse saw (4 to 5 points per inch) is to be used. A fine saw is better for smooth, accurate cutting in dry wood. Saws are to be kept sharp and well set to prevent binding.

Axes

- An axe person is to make sure that there is a clear circle in which to swing the axe before starting to chop. Also, all vines, brush, and shrubbery within the range should be removed, especially overhead vines that may catch or deflect the axe.
- Axe blades shall be protected with a sheath or metal guard wherever possible. When the blade cannot be guarded, it is safer to carry the axe at one's side. The blade on a single-edged axe shall be pointed down.

Hatchets

- Hatchets shall not be used for striking hard metal surfaces since the tempered head may injure the user or others by flying chips. When using a hatchet in a crowded area, staff shall take special care to prevent injury to themselves and other workers. Using a hatchet to drive nails is prohibited.

4.8.3. Miscellaneous Cutting Tools

Planes, Scrapers, Bits, and Drawknives

- Planes, scrapers, bits, and drawknives are to be used only by experienced staff.
- These tools are to be kept sharp and in good condition.

- The principal hazard in the use of knives is that hands may slip from the handle onto the blade or that the knife may strike the body or the free hand. A handle guard or a finger ring (and swivel) on the handle eliminates these hazards. Adequate guarding is important.
- Personnel who must carry knives with them on the job shall keep them in sheaths or holders. Never carry a sheathe knife on the front part of a belt. Always carry it over the right or left hip, toward the back. This will prevent severing a leg artery or vein in case of a fall.
- Knives must never be left lying on benches or in other places where they may cause hand injuries. Safe placing and storing of knives is important to knife safety.
- Supervisors must make certain that personnel who handle knives have ample room in which to work so they are not in danger of being bumped by other workers.
- Supervisors should be particularly careful about the hazard of personnel leaving knives hidden under a product, under scrap paper or wiping rags, or among other tools in work boxes or drawers. Knives are to be kept separate from other tools to protect the cutting edge of the knife as well as to protect the staff.
- Horseplay shall be prohibited around knife operations. Throwing, "fencing", trying to cut objects into smaller and smaller pieces, and similar practices are not only dangerous but reflect inadequate supervision. .
- Supervisors shall assure that nothing is cut that requires excessive pressure on the knife. Knives shall not be used as a substitute for can openers, screwdrivers, or ice picks.

4.8.4. Torsion Tools

Note: Socket wrenches are safer to use than adjustable or open-end wrenches.

Open-End or Box Wrenches

- Open-end or box wrenches shall be inspected to make sure that they fit properly and are never to be used if jaws are sprung or cracked. When defective they shall be taken out of service until repaired.

Socket Wrenches

- Socket wrenches give great flexibility in hard-to-reach places. The use of special types shall be encouraged where there is danger of injury.

Adjustable Wrenches

- Adjustable wrenches are used for many purposes. They are not intended, however, to take the place of standard open-end, box or socket wrenches. They are used mainly for nuts and bolts that do not fit a standard wrench. Pressure is always applied to the fixed jaw.

Pipe Wrenches

- Pipe wrenches, both straight and chain tong, shall have sharp jaws and be kept clean to prevent slipping.
- The adjusting nut of the wrench is to be inspected frequently. If it is cracked, the wrench shall be taken out of service. A cracked nut may break under strain, causing complete failure of the wrench and possible injury to the user.
- A piece of pipe "cheater" slipped over the handle shall not be used to give added leverage because this can strain a pipe wrench to the breaking point. The handle of every wrench is designed to be long enough for the maximum allowable safe pressure.
- A pipe wrench should never be used on nuts or bolts, the corners of which will break the teeth of the wrench, making it unsafe to use on pipe and fittings. Also, a pipe wrench, when used on nuts and bolts, damages their heads. A pipe wrench shall not be used on valves, struck with a hammer, nor used as a hammer.

Pliers

- Side-cutting pliers sometimes cause injuries when short ends of wires are cut. A guard over the cutting edge and the use of safety glasses will help prevent eye injuries.
- The handles of electricians' pliers are to be insulated. In addition, staff shall wear the proper electrical rated gloves if they are to work on energized lines.
- Pliers shall not be used as a substitute for a wrench.

Special Cutters

- Special cutters include those for cutting banding wire and strap. Claw hammers and pry bars shall not be used to snap metal banding material.

Pipe Tongs

- Staff and contractors must neither stand nor jump on the tongs nor place extensions on the handles to obtain more leverage. They should use larger tongs.

Screwdrivers

- The practice of using screwdrivers for punches, wedges, pinch bars, or pries shall not be allowed.
- Cross-slot (Phillips-head) screwdrivers are safer than the square bit type, because they have less tendency to slip. The tip must be kept clean and sharp, however, to permit a good grip on the head of the screw.
- The part to be worked upon must never be held in the hands; it should be laid on a bench or flat surface or held in a vise.
- No screwdriver used for electrical work shall have the blade or rivet extending through the handle. Both blade and handle shall be insulated except at the tip.

4.8.5. Shock Tools

Hammers

- A hammer is to have a securely wedged handle suited to the type of head used. The handle shall be smooth, without cracks or splinters, free of oil, shaped to fit the hand, and of the specified size and length. Personnel shall be warned against using a steel hammer on hardened steel surfaces.
- Instead, a soft-head hammer or one with a plastic, wood, or rawhide head should be used.
- Safety goggles or safety glasses shall be worn to protect against flying chips, nails, or scale.

Riveting Hammers

- Riveting hammers, often used by sheet metal workers, must have the same kind of use and care as ball pen hammers and should be watched closely for cracked or chipped faces.

Carpenter's or Claw Hammers

- The faces shall be kept well-dressed at all times to reduce the hazard of flying nails while they are being started into a piece of wood. A checker-faced head is sometimes used to reduce this hazard.
- Eye protection is advisable for all operators and all staff working in the same area.

Spark-Resistant Tools

- Around flammable substances, sparks produced by iron and steel hand tools can be a dangerous ignition source. Where this hazard exists, spark-resistant tools made from brass, plastic, aluminum, or wood will provide for safety.

4.8.6. Power Tools

General

Power tools can be hazardous when improperly used. There are several types of power tools, based on the power source they use: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

Staff and contractors should be trained in the use of all tools - not just power tools. They should understand the potential hazards as well as the safety precautions to prevent those hazards from occurring.

The following general precautions should be observed by power tool users:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.

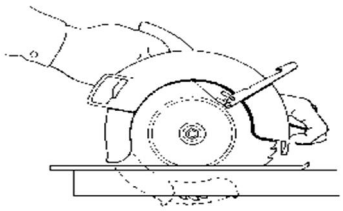
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- All observers should be kept at a safe distance away from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. The worker should not hold a finger on the switch button while carrying a plugged-in tool.
- Tools should be maintained with care. They should be kept sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance.
- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- All portable electric tools that are damaged shall be removed from use and tagged "Do Not Use."

Guards

Hazardous moving parts of a power tool need to be safeguarded. For example, belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded if such parts are exposed to contact by staff.

Guards, as necessary, should be provided to protect the operator and others from the following:

- Point of operation
- In-running nip points
- Rotating parts
- Flying chips and sparks



Safety guards must never be removed when a tool is being used. For example, portable circular saws must be equipped with guards. An upper guard must cover the entire blade of the saw. A retractable lower guard must cover the teeth of the saw, except when it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work.

Safety Switches

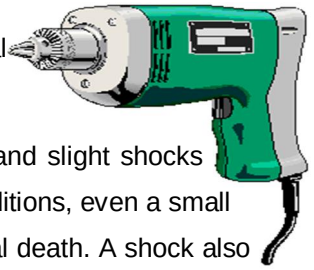
The following hand-held powered tools must be equipped with a momentary contact "on-off" control switch: drills, tappers, fastener drivers, horizontal, vertical and angle grinders with wheels larger than 2 inches in diameter, disc and belt sanders, reciprocating saws, saber saws, and other similar tools. These tools also may be equipped with a lock-on control

provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

The following hand-held powered tools may be equipped with only a positive "on-off" control switch: platen sanders, disc sanders with discs 2 inches or less in diameter; grinders with wheels 2 inches or less in diameter; routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks <-inch wide or less.

Other hand-held powered tools such as circular saws having a blade diameter greater than 2 inches, chain saws, and percussion tools without positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when the pressure is released.

Electric Tools



Staff, contractors using electric tools must be aware of several hazards; the most significant is the possibility of electrocution.

Among the primary hazards of electric-powered tools are burns and slight shocks which can lead to injuries or even heart failure. Under certain conditions, even a small amount of current can result in fibrillation of the heart and eventual death. A shock also can cause the user to fall off a ladder or other elevated work surface.

To protect the user from shock, tools must either have a three-core cord with ground and be grounded, or be powered by a low-voltage isolation transformer. Three-core cords contain two current-carrying conductors and a grounding conductor. One end of the grounding conductor connects to the tool's metal housing. The other end is grounded through a prong on the plug. Anytime an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong should never be removed from the plug.

These general practices should be followed when using electric tools:

- Electric tools should be operated within their design limitations.
- Gloves and safety footwear are recommended during use of electric tools.
- When not in use, tools should be stored in a dry place.
- Electric tools should not be used in damp or wet locations.
- Work areas should be well lighted.
- Electric cords shall be inspected periodically and kept in good condition. Heavy-duty plugs that clamp to the cord should be used to prevent strain on the current-carrying parts, if the cord is accidentally pulled.
- Although no guards are available for drill bits, some protection is afforded if drill bits are carefully chosen for the work to be done, such as being no longer than necessary to do the work.
- Where the operator must guide the drill with the hand, the drill is to be equipped with a sleeve that fits over the drill bit. Oversized bits shall not be ground down to fit small electric drills; instead, an adapter should be used that will fit the large bit

and provide extra power through a speed reduction gear; however this again is an indication of improper drill size. When drills are used, the pieces of work are to be clamped or anchored to prevent whipping.

- Electric saws are usually well guarded by the manufacturer, but staff must be trained to use the guard as intended. The guard should be checked frequently to be sure that it operates freely and encloses the teeth completely when it is cutting.
- Circular saws shall not be jammed or crowded into the work. The saw is to be started and stopped outside the work.

Powered Abrasive Wheel Tools

Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments.

Before an abrasive wheel is mounted, it should be inspected closely and sound- or ring-tested to be sure that it is free from cracks or defects. To test, wheels should be tapped gently with a light non-metallic instrument. If they sound cracked or dead, they could fly apart in operation and so must not be used. A sound and undamaged wheel will give a clear metallic tone or "ring."

To prevent the wheel from cracking, the user should be sure it fits freely on the spindle. The spindle nut must be tightened enough to hold the wheel in place, without distorting the flange. Follow the manufacturer's recommendations. Care must be taken to assure that the spindle wheel will not exceed the abrasive wheel specifications. Futhermore, the design RPM speed of the disc shall be equal to or greater than the operating RPM speed of the equipment to be used, to ensure that the disc will withstand the loading of the equipment.

Due to the possibility of a wheel disintegrating (exploding) during start-up, the staff should never stand directly in front of the wheel as it accelerates to full operating speed.

Portable grinding tools need to be equipped with safety guards to protect workers not only from the moving wheel surface, but also from flying fragments in case of breakage.

In addition, when using a powered grinder:

- Always use eye protection.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.

Floor stand and bench mounted abrasive wheels, used for external grinding shall be provided with safety guards (protection hoods). The maximum regular exposure of the grinding wheel periphery and sides shall be not more than 90 degrees except that, when work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 125 degrees.

Safety guards shall be strong enough to withstand the effect of a bursting wheel.

Floor and bench-mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable.

Such work rests shall be kept at a distance not to exceed one-eighth inch from the surface of the wheel.

Cup type wheels used for external grinding shall be protected by either a revolving cup guard or a band type guard. All other portable abrasive wheels used for external grinding shall be provided with safety guards (protection hoods), except as follows:

When the work location makes it impossible, a wheel equipped with safety flanges shall be used.

When wheels 2 inches or less in diameter which are securely mounted on the end of a steel mandrel are used.

All abrasive wheels shall be closely inspected and ring-tested before mounting to ensure that they are free from cracks and defects.

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.

All staff using abrasive wheels shall be protected by eye protection equipment.

Dust-type safety goggles or plastic face shields should be worn and, if dust is created, a respirator approved by the National Institute for Occupational Safety & Health (NIOSH) for the exposure should be worn.

If a sander is used steadily, it should be dismantled periodically, as well as thoroughly cleaned every day by being blown out with low-pressure air. If compressed air is used the operator shall wear safety goggles or work with a transparent chip guard between his body and the air blast.

Because wood dust presents a fire and explosion hazard, keep dust to a minimum; sanders can be equipped with a dust collection or vacuum bag. Electrical equipment shall be designed to minimize the explosion hazard. Fire extinguishers approved for Class C (electrical) fires should be available

4.8.7. Pneumatic Tools

Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders.

There are several dangers encountered in the use of pneumatic tools. The main one is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

Eye protection is required and face protection is recommended for staff working with pneumatic tools.

Noise is another hazard. Working with noisy tools such as jackhammers requires proper, effective use of hearing protection.

When using pneumatic tools, staff must check to see that they are fastened securely to the hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool will serve as an added safeguard.

A safety clip or retainer must be installed to prevent attachments, such as chisels on a chipping hammer, from being unintentionally shot from the barrel.

Screens must be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

Compressed air guns should never be pointed toward anyone. Users should never "dead-end" it against themselves or anyone else.

The following safety practices will be applied when using pneumatic tools:

- The operating trigger on portable hand-operated utilization equipment shall be so located as to minimize the possibility of its accidental operation and shall be arranged to close the air inlet valve automatically when the pressure of the operator's hand is removed.
- Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tools from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 p.s.i. pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.
- Compressed air shall not be used for cleaning purposes except with an air blow gun limited to 30 p.s.i. static pressure at the outlet nozzle and then only with effective chip guard and personal protective equipment.
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fitting shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All hoses exceeding 1/2-inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
- Airless spray guns of the type which atomize paints and fluids at high pressures (1,000 pounds or more per square inch) shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.
- In lieu of the above, a diffuser net which will prevent high pressure, high velocity release, while the nozzle tip is removed, plus a nozzle tip guard which will prevent the tip from coming in contact with the operator, or other equivalent protection shall be provided.

4.8.8. Fuel Powered Tools

The following safety practices will be applied when using Fuel Powered tools:

- All fuel powered tools shall be stopped while being refueled, serviced, or maintained, and fuel shall be transported, handled, and stored in approved safety cans.
- Leakage or spillage of flammable or combustible liquids shall be disposed of promptly and safely.
- When fuel powered tools are used in enclosed spaces, the applicable requirement for concentrations of toxic gases and use of personal protective equipment shall apply.

4.8.9. Hydraulic Power Tools

The following safety practices will be applied when using Hydraulic Power tools:

- The fluid used in hydraulic powered tools shall be fire-resistant and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.
- The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.
- All jacks – lever and rachet jacks, screw jacks, and hydraulic jacks - must have a device that stops them from jacking up too high. Also, the manufacturer's load limit must be permanently marked in a prominent place on the jack and should not be exceeded.
- A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up.
- Use wooden blocking under the base if necessary to make the jack level and secure. If the lift surface is metal, place a 1-inch-thick hardwood block or equivalent between it and the metal jack head to reduce the danger of slippage.
- When setting up a jack, ensure:
  - the base rests on a firm level surface,
  - the jack is correctly centered,
  - the jack head bears against a level surface, and
  - the lift force is applied evenly.
- Proper maintenance of jacks is essential for safety. All jacks must be inspected before each use and lubricated regularly. If a jack is subjected to an abnormal load or shock, it should be thoroughly examined to make sure it has not been damaged.

4.8.10. Use and Maintenance of Power Tools

The following safety practices will be applied when using Power tools:

- These tools should not be used in an explosive or flammable atmosphere.
- Only personnel who have been trained in the operation of the particular tool in use shall be allowed to operate a power tool.
- The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
- Any tool found not in proper working order or one that has developed a defect during use shall be removed from service immediately and not used until properly repaired.
- Adequate eye, head, face and/or personal protective equipment as necessitated by working conditions shall be utilized by the operators and persons working in the area.
- The tool shall be designed so that it cannot be fired unless it is equipped with a standard protective shield or guard or a special shield, guard, fixture, or jib.
- The firing mechanism shall be designed so that the tool cannot fire during loading or preparation to fire or if the tool is dropped while loaded. Firing of the tools shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position
- The tool shall be designed so as not to be operable other than against a work surface and unless the operator is holding the tool against the work surface with force at least 5 pounds greater than the weight of the tool.
- The tool shall be designed so that it will not operate when equipped with the standard guard indexed to the center position if any bearing surface of the guard is tilted more than 8 degrees from contact with the work surface.
- The tool shall be designed so that positive means of varying the power are available or can be made available to the operator as part of the tool or as an auxiliary, to facilitate selection of a power level adequate to perform the desired work without excessive force.
- The tool shall be designed so that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.
- Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any staff. Hands shall be kept clear of the open barrel end.
- Loaded tools shall not be left unattended.
- Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.

- Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
- Power-assisted, hammer-driven tools are used for the same purposes as power tools and generally the same precautions are to be followed.

4.8.11. Woodworking Tools

The following safety practices will be applied when using woodworking tools:

- Personal Protective Equipment - All personnel using woodworking tools shall be protected by eye protection equipment.
- Guarding - All portable, power-driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for beveled cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.
- Disconnect Switches - All "fixed" power driven wood-working tools shall be provided with a disconnect switch that can either be locked or tagged in the "off" position.
- Self-feed - Automatic feeding devices shall be installed on machines whenever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points
- Speeds - The operating speed shall be etched or otherwise permanently marked on all circular saws over 20 inches in diameter or operating at over 10,000 peripheral feet per minute. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is re-tensioned for a different speed, the marking shall be corrected to show the new speed.

4.9 Welding and Cutting Materials

4.9.1. Definitions

Gas – Slower and easier to control than electric arc. Uses gas flame over metals until molten puddle is formed. Most popular fuels used with oxygen include acetylene.

Arc – Two metals are joined by generating an electric arc between a covered metal electrode and the base metal.

Oxygen Cutting - Metal is heated by gas flame and an oxygen jet does the cutting

Arc Cutting - Intense heat of electric arc melts away the metal.

4.9.2. General Requirement

The following safety practices will be applied when welding and cutting materials:

- When combustibles cannot be moved from the welding/cutting area, the requirements of NFPA 51B shall be followed. No cutting and welding operation will be permitted without authorization in the PTW.
- Suitable fire extinguishers shall be available.
- Fire watches are required if welding of cutting and combustibles in the area could be easily ignited by sparks. This could be greater than or less than 35 feet (10.67 meters) from point of operation.
- Cutting or welding shall not be conducted in areas not specifically authorized by the PTW, in the presence of explosive atmospheres which exist or may develop, and where quantities of combustibles are store.
- For contractor operations, the contractor's nominated Maintenance Engineer is responsible for the safe handling and use of the cutting and welding equipment.
- Areas shall be made fire safe before cutting or welding is conducted.
- No welding or cutting shall be done on used drums, barrels, tanks, or containers until they have been cleaned thoroughly.
- All welding cables shall be placed so they are clear of passageways, ladders and stairways.

4.9.3. Oxygen-Fuel, Gas Welding and Cutting

When transporting, moving, and storing Compressed Gas Cylinders, follow the safety practices detailed in *QU SOP-03 Compressed Gas Cylinders*.

When using fuel gases, the following safety practices will be applied:

- Only properly instructed and qualified staff, contractors will operate equipment using fuel gases.
- Fuel gas shall not be taken into confined spaces.
- Fuel gas and oxygen manifolds must be clearly identified and placed in well-ventilated area. The manifold hose connections must be such that the hose cannot be interchanged between fuel gas and oxygen manifolds. Header connections will be supplied.
- Oxygen and fuel gas hoses must be easily distinguished from each other by color or surface characteristics. Torches must be inspected at the beginning of each shift for leaking valves, couplings, and connections. Pressure regulators must be in proper working order while in use.
- Cylinders not having fixed hand wheels shall have keys, handles or non-adjustable wrenches on valves stems while in service.
- Valves shall be closed before moving cylinders.

- Valves shall be closed when work is finished.
- Empty cylinder valves shall be closed.
- Before connecting the regulator, the valve shall be opened slightly and closed immediately while the operator stands to one side of the outlet.
- Acetylene cylinder valves shall be opened as little as one-half turn of the spindle - preferably no more than three-fourths of a turn.
- When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use.
- Acetylene shall never be utilized at a pressure in excess of 15 pounds per square inch gage (p.s.i.g.) (1.06 kilograms per square centimeter).

When Arc Welding and Cutting the following safety practices will be applied:

- Oxygen cylinders and fitting shall be kept away from combustible material, especially oil and grease, as oxygen is not compatible with these products.
- Only the correct manual electrode holders shall be used. If the portion gripped by the hand contains current, it must be fully insulated against the maximum voltage encountered to ground.
- Proper welding cables and connectors must be used and must be completely insulated. Splicing, if used, shall be equal to the insulating quality of the cable and shall not be located within 3.05 meters (10 feet) of the electrode holder.
- Ground return cables must have a safe current-carrying capacity equal to or greater than the specified maximum output capacity of the units serviced. When a structure or pipeline is employed as a ground circuit, a determination must be made that the required electric contact exists at all joints.
- The frames of all arc welding and cutting machines shall be grounded with a third wire or a separate wire which is grounded at the source of the current.
- Arc welding or cutting operations shall be shielded by noncombustible or flameproof screens to protect staff and other persons in the vicinity from the direct rays of the arc.
- Staff and contractors performing any type of welding, cutting or heating shall be protected by suitable eye protection equipment.

When Resistance welding, the following safety practices will be applied

- All equipment shall be installed by a qualified electrician.
- A safety type disconnecting switch, circuit breaker or circuit interrupter shall be provided near the machine.
- Operators shall be properly trained and judged competent to operate the equipment before being designated to do so.
- Controls of all automatic air and hydraulic chargers shall be guarded against accidental activation.
- All doors and panels shall be kept blocked on the resistance welding machines.

- Appropriate shields shall be provided to protect workers and passing staff from the sparks.
- Fire curtains shall be provided.
- For spot and seam welding, voltage shall not exceed 480 volts during operation.

When welding, Cutting, and Heating Relative to Preservation Coatings:

- The flammability of protective coatings must be determined before welding, cutting, or heating is commenced on such surfaces.
- When coatings are highly flammable, they shall be stripped from the area to prevent ignition. Protective measures must be taken when the preservative coating is toxic.

4.10 Heat Stress Management

4.10.1. Background

Heat Stress is influenced by several risk factors: climatic conditions, the work environment, demands of the work, clothing and personal characteristics.

Climatic and environmental conditions that affect the risk of heat-related disorders are air temperature and humidity, air movement, and the temperature of surrounding surfaces which affects radiant heat exchange.

Demands of the work influence the stress on the temperature regulation system. Individual responses to a given work load vary but, as an staff expends more energy, the body's internal metabolic heat production rises. This increases stress on the cardiovascular system to regulate body temperature (i.e., by increasing blood flow to skin). Work-related factors that influence heat stress include work rate, level of physical effort, and duration of activity.

Clothing characteristics such as insulation, permeability, weight, fit and ventilation affect the body's ability to regulate internal temperatures. Other factors that may increase the risk of heat-related disorders include additional equipment, the use of a respirator, or other personal protective equipment (PPE).

Personal characteristics such as age, weight, previous heat stress injury, underlying medical conditions (e.g., diabetes, cardiovascular disorders, chronic pulmonary disease, and thyroid disorders), medication use and overall health and physical fitness contribute to an staff susceptibility of contracting a heat-related illness.

Working in an environment with heat stress not only increases the risk for specific heat related conditions such as heat exhaustion and heat stroke, but also increases the risk for other adverse events.

4.10.2. Signs and Symptoms of Heat-Related Disorders

Heat related disorders may occur when there is an exposure to heat risk factors. The table below illustrates some of the signs and symptoms associated with heat stress. If the staff is experiencing any of these symptoms, the staff should be taken to the medical clinic for treatment immediately.

DISORDER	SIGNS	SYMPTOMS
Dehydration	• Loss of work capacity • Delayed response to stimuli	• Fatigue • Weakness • Dry mouth
Heat Exhaustion	• High pulse rate, confusion, anxiety • Profuse sweating • Low blood pressure • Pale face, or flushing • Body temperature increased but below 104 degrees F. • Excessive thirst, decreased urine output	• Fatigue, malaise • Weakness • Blurred vision • Dizziness • Headache • Nausea • Loss of appetite
Heat rash	• Skin eruptions	• Itching skin, prickly sensation
Heat Stroke	• Red face • Mental status changes such as disorientation, • confusion or irritability • Hot, dry skin • Erratic behavior • Collapse • Shivering • Body temperature >104 F	• May be same as those for heat exhaustion (see above)
Heat Cramps	• Incapacitating pain in muscle	• Muscle cramps (abdominal and lower extremities) • Fatigued muscles
Heat Syncope	• Brief fainting or near fainting behavior	• Blurred vision

4.10.3. Preventive Controls

A control is a mechanism used to minimize or eliminate an exposure to a hazard, such as heat. There are three types of controls (e.g. engineering, administrative and personal protective equipment) that can be implemented to reduce exposure to excessive heat.

Each person and situation is unique, so controls and their application will vary. ESO can be contacted to assist in selecting the most appropriate preventive measures for specific situations.

Administrative Controls

Administrative controls, also known as work strategy controls, are strategies used by supervisors to limit exposure to a hazard. For example, changes to the work schedule (i.e., when and how the job is performed) can limit the amount of time an staff is exposed to elevated temperatures

Engineering Controls

Engineering controls are physical changes made to the work environment, such as adding fans or air conditioning to an indoor environment.

Work Practices and Personal Protective Equipment (PPE)

Other than hats and loose-fitting clothing, there is a limited selection of personal protective equipment to reduce the risk of heat stress. Contact ESO for help in evaluating the effectiveness of available personal protective equipment.

In some cases, personal protective equipment—such as impermeable protective clothing and respirators—may increase the risk of developing a heat-related disorder. If such PPE is truly necessary, administrative and engineering controls may be necessary to allow work in heat risk environments. Contact the ESO for help with these decisions.

4.10.4. Monitoring for Signs and Symptoms of Heat Stress

Supervisors, co-workers and staff themselves are responsible for monitoring for the signs and symptoms of heat-related disorders. See the above table for information on recognizing the signs and symptoms of impending heat stress. A supervisor or co-worker is often in the best position to observe the onset of a heat-related disorder.

When heat stress risks are present, supervisors should regularly check workers (by observation and questions) for signs and symptoms of heat stress.

Extra care shall be taken to monitor those at high risk, such as staff who are older or overweight, staff who overexert themselves, and staff with chronic medical conditions including diabetes, heart or lung disease, thyroid disease or high blood pressure. Staff who take certain medications may also be at increased risk and need to check with their physician.

Personnel working outdoors or within indoor environments with elevated temperatures, should self-monitor for the signs and symptoms of heat-related illness, such as taking pulses.

Use a buddy system. When working in the heat, personnel shall monitor the condition of coworkers.

Supervisors should check to ensure that staff are self-monitoring, and ask for their determinations.

4.10.5. Issue Heat Alerts

When conditions are present that contribute to heat stress, departments and work units are to alert at risk staff and implement their preventive measures for working in heat. The alert should include a reminder of signs and symptoms, how to control exposure, and a re-emphasis of the preventive work strategies to be followed.

4.11 Confined Space Procedures

A Confined Space is defined as a space with limited or restricted means for entry and exit and is not intended for continuous staff occupancy. Confined spaces include but are not limited to manholes, pipelines, sewers, tunnels, and pressure vessels.

4.11.1. Permit-Required Confined Space (PRCS)

A Permit-Required Confined Space is a confined space where one or more of the following characteristics are met:

- Contains or has a known potential to contain a hazardous atmosphere. Three of the most common atmospheric conditions that constitute hazards are oxygen deficiency, presence of combustible gases and vapors, and toxic gases and vapors.
- Contains a material with the potential for engulfment of an entrant.
- Contains any other recognized serious safety or health hazard.

4.11.2. Identification of Permit-Required Confined Spaces

Each department is to identify all confined spaces and those suspected of being a PRCS. Subsequent to identification, the department should contact the ESO to assist in the evaluation of those spaces.

A Confined Space and PRCS Recognition Checklist is provided in *Appendix B* to enable a systematic and consistent assessment and identification process.

4.11.3. Warning Signage

PRCSs must be posted with warning signs notifying staff of any hazards that are present, and that only authorized entrants may enter the PRCS. An example warning sign may be:

DANGER

PERMIT- REQUIRED CONFINED SPACE

DO NOT ENTER

4.11.4. Evaluation of Permit-Required Confined Space Condition

Each PRCS must be evaluated to identify hazards; determine the severity the hazards; and establish control procedures and practices by which the space may be entered safely. A "Confined Space Hazard Evaluation" form must be completed for each PRCS.

Before entry into a PRCS is authorized, the conditions within the space must be tested to determine if acceptable entry conditions exist. The space must be monitored during the course of entry operations to determine if acceptable entry conditions are being maintained. When testing for atmospheric hazards first test for oxygen deficiency, then for combustible gases and vapors, and then for toxic gases and vapors.

4.11.5. PTW System

Before entering a PRCS an authorized staff must complete a PTW for the activity. Please refer to *QU EHSMS Section 7.1 - PTW procedure* for further guidance.

4.11.6. Authorized Personnel

Definitions and roles for personnel involved in confined space operations are as follows:

- Authorized Entrant - A staff member who is authorized by the employer to enter a permit required space. Only staff who are trained as an entrant and have obtained a permit signed by the entry supervisor may enter a permit required confined space.
- Attendant - An individual who is stationed outside and monitors authorized entrants. At least one individual must be stationed outside the permit required confined space.
- Entry Supervisor – is a supervisor or foreman responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry, for overseeing entry, and for terminating entry.

4.11.7. Pre-Entry and Entry Practices and Procedures

The ESO shall review and approve the pre-entry and entry procedures prior to entry. Practices and procedures to be addressed include:

- Isolating (locking and tagging) the PRCS.
- Ventilation of the PRCS.
- Providing vehicle and pedestrian barriers to protect entrants from external hazards.
- Verifying that conditions are acceptable for entry.

4.11.8. Locking and Tagging

No work is to be performed until appropriate locking, tagging and/or isolation is accomplished to prevent the inadvertent actuation of operations or processes associated with the space which might expose personnel to hazardous conditions.

Refer to *QU SOP 01 – Lockout / Tagout*.

4.11.9. Required Equipment

The following equipment is to be provided and maintained to ensure their proper use:

- Testing and monitoring equipment
- Ventilating equipment
- Communications equipment
- Personal protective equipment
- Lighting equipment
- Barriers and shields
- Ladders
- Rescue equipment
- Other equipment necessary for safe entry

4.11.10. Rescue Team

If an emergency arises that requires a rescue team, the Emergency Medical Service is to be contacted through CSU Control Room 4403 3600. Control Operator shall call 999.

The rescue service is to be provided access to all PRCSs from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

Non-entry retrieval methods are to be used unless the retrieval equipment would increase the overall risk of entry. Each authorized entrant is to use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level. For vertical type PRCSs more than 5 feet deep, a mechanical device for retrieval is to be available.

Refer to *QU EHSMS Section 8.0 – Emergency Management procedure* for further guidance.

4.11.11. Training

Personnel who are assigned duties that may require entry into PRCS must receive training on confined space entry procedures, the permit system, and hazard recognition and control procedures. Authorized entrants, attendants, and supervisors in charge of entry are to receive training in their respective confined space duties and responsibilities. Training is to be provided: before staff are first assigned duties pertaining to PRCSs; whenever there is a change in assigned duties; whenever there is a change in PRCS operations that present a hazard about which an staff has not been trained; and whenever there are deviations from

the entry permit procedures or inadequacies in the staff use or knowledge of these procedures.

Refer to *QU EHSMS Section 11.0 – Training and Competency procedure* for further guidance.

4.11.12. Entry Into Non-Permit Confined Spaces

Precautions must be taken also for entry into non-permit required spaces. The space atmosphere must be tested for oxygen concentration, combustible gas or vapor, and potential toxic contaminants. Any hazardous conditions detected must be reported to the supervisor and ESO. Manholes and confined spaces with limited ventilation must be power ventilated with a blower (minimum capacity 750 cfm) operating at its maximum rated speed for a minimum of 5 minutes. Larger confined spaces (greater than 1000 cubic feet) must be ventilated for at least 10 minutes. The blower must be in continuous operation while anyone is in the confined space.

4.12 Emergency Preparedness and Response

Emergency preparedness and response will be managed in accordance with *QU EHSMS Section 8.0 – Emergency Management Procedure*, and subordinate procedures, i.e.:

- **QU EHSMS Section 8.1 - First Aid and Medical Emergency Plan**
- **QU EHSMS Section 8.2 - Fire Safety and Response Plan**
- **QU EHSMS Section 8.3 - Earthquake Response Plan**
- **QU EHSMS Section 8.4 - Spill Response Plan**
- **QU EHSMS Section 8.5 - Power Outage Response Plan**

4.12.1.1. Fire Safety

General fire safety management requirements applicable to all QU facilities and activities will be applied in operations and maintenance activities in accordance with **QU EHSMS Section 8.2 - Fire and Safety Response Procedure**, and **Section 8.0 – Emergency Management Procedure**.

Additionally, some specific fire safety precautions to be observed for any QU operations and maintenance activities are:

- Smoking is one of the major causes of fires in the work area. At Qatar University, smoking is prohibited in all work area where the staff and contractor/s perform their specific activities.
- Access key custody of offices, laboratories, stores, etc. should be assigned to the Security in-charged at respective buildings. Users should maintain a duplicate key.

4.13 Incidents and Accidents

Incidents, accidents and near-misses, and associated incident investigations will be reported and managed in accordance with **QU EHSMS Section 12.0 - Hazard, Near Miss, Incident Reporting and Investigation.**

4.14 Waste Management

- Waste minimisation through efficient design, procurement and material management practices.
- Implement procurement / purchasing policies, such as:
  - Specifying the exact quantity of material required;
  - Preference of materials with limited packaging, or ordering of materials in bulk to minimize packaging waste;
  - Negotiate return or buy-back arrangements with suppliers for containers (e.g. chemical containers) and packing materials; and
  - Purchase environmentally-friendly materials (i.e. materials with recycled content or with energy-efficient features).
- Where practical, incorporate the use of pre-fabricated materials to minimise onsite waste generation.
- Use of disposal materials such as plastic cups will be discouraged.
- Adopt a policy on double-sided printing to minimise paper use and waste paper generation.
- Establish waste segregation program including:
  - Provision of designated areas and suitable containers / bins for each type of waste;
  - As a minimum, hazardous waste will be segregated from non-hazardous waste; and
  - Establish a labelling system for waste storage and containers to prevent cross-contamination. Where possible, labels will be in English and Arabic.
- Consider reuse of scrap materials, where possible, e.g.:
  - Reuse of paper for drafts;
  - Reuse of excavated materials for site filling purposes;
  - Reuse of scrap wood for pallets, signage and temporary structures onsite; and
  - Reuse of scrap metal sheets for drip trays.
- Ensure efficient use of chemicals and other hazardous materials via establishing standard procedures and providing training / toolbox talk to relevant staff.
- Send recyclable wastes (including waste fuel / oil) to a suitable recycling facility.
- Provide waste management training to relevant site staff and workers. Training will include waste minimisation, reuse, segregation and recycling procedures relevant to their line of work.

- Engage services of an approved waste contractor for waste collection, transport and disposal.
- Keep records of the following:
  - Types and volume of wastes generated;
  - Date of collection; and
  - Waste manifest form.
- Prohibit open burning, burying and indiscriminate dumping of waste.
- Provide appropriate containers (water-tight) according to the type of waste (i.e. food waste containers should be provided with lids to prevent infestation).
- Locate waste bins strategically such that these can readily be accessed by workers, and at areas where wastes are mostly generated.
- Avoid overfill waste bins.
- Conduct regular housekeeping.
- Provide suitable storage facilities with impervious surfaces / floor in order to prevent leaching materials into soil and groundwater.
- Label waste containers, storage / stockpile areas, and other waste facilities to avoid cross contamination issues. Where practical, labels will be written in English and Arabic (and language understood by the workers who need to manage the waste, where applicable).
- Locate or position waste facilities such that these are protected from potential wind dispersion.
- Locate waste facilities at least 50 feet away from stormwater flow paths / network.
- Waste storage areas will be restricted, warning sign put in place.

4.15 EHS Training and Induction

EHS-related induction and training for QU staff, students, contractors and visitors conducting operations and maintenance procedures will be planned and conducted in accordance with **QU EHSMS Section 11.0 – Training and competency Procedure**.

At a minimum training shall cover the requirements of this Technical Guidance document and any specific training as identified by the risk assessment.

4.16 EHS Inspections and Audits

EHSMS compliance audits and inspections of operations and maintenance activities on QU facilities will be performed in accordance with **QU EHSMS Section 14.0 – Inspection and Audit Procedure**. Any non-conformances identified during inspections and audits will be recorded and managed via the Corrective Action Request process presented in this procedure.

5 Document Control

This Technical Guideline is a controlled document. The controlled version of this guideline is located on the QU Electronic Documentation Management System.

Any printed copies of this controlled document are reference copies only. It is the responsibility of all of those with printed copies to ensure their copy is kept up to date.

Refer to *QU EHSMS Section 16.0 – Document Control and Record Retention*.

6 Appendices

Appendix A: Work Equipment Assessment Checklist

Appendix B: Confined Space and PRCS Recognition Checklist

Appendix A – Work Equipment Assessment Checklist

WORK EQUIPMENT ASSESSMENT CHECKLIST

Reference No. _____

Equipment Description	
Assessment No.: _____	Assessor: _____
Assessment Date: _____	Signature: _____

Suitability	**YES**	**NO**	**Is Action Required**		**Action Taken**
			YES	NO	
Is the equipment suitable for:					
The purpose for which it is intended?					
The location in which it is being used?					
Does the equipment itself pose any significant risks (fumes etc)?					
Maintenance / Use					
For maintenance purposes does the equipment require:					
A simple visual inspection?					
Portable electrical appliance test?					
Statutory inspection?					
Planned preventive maintenance?					
Maintenance log?					
Are there any specific risk that require the equipment to be:					
Used by authorized person only?					
Maintained by authorized person only?					

WORK EQUIPMENT ASSESSMENT CHECKLIST (cont.)

Information, Instruction, Training & Supervision	YES	NO	Is Action Required		Action Taken
			YES	NO	
Have all the users been given use instruction?					
Verbal					
Written					
Is documentary evidence for the above available?					
Have all the users been given Health and Safety information?					
Verbal					
Written					
Is documentary evidence for the above available?					
Dangerous Parts					
Does the equipment present any specific hazards?					
If "yes" have adequate control measures been implemented?					
Does the equipment have any guards fitted?					
If "yes" are they inspected in a regular basis?					
Does the equipment present any risk from high or low temperature?					
If "yes" have adequate control measures been taken?					
Does the equipment require Personal Protective Equipment?					
If "yes" have the adequate control measures been under taken?					
Is the documentary evidence for the above available?					

WORK EQUIPMENT ASSESSMENT CHECKLIST (cont.)

Control Systems and Stop Measures	YES	NO	Is Action Required		Action Taken
			YES	NO	
Does the equipment have any control systems (start/stop buttons etc.)?					
If "yes" are they suitably marked?					
Does the equipment have an emergency stop?					
If "yes" is it suitably marked?					
Can the equipment be isolated from an energy source?					
If "yes" is the method of isolation accessible?					
General Is the item of equipment stable?					
Is the lighting for the equipment adequate?					
Can the maintenance on the equipment be carried out without risk to health?					
Does the equipment require any specific warning signs other than those previously covered under the control section?					
Have all relevant Supervisor's been given use instructions?					
Verbal					
Written					
Is the documentary evidence for the above available?					

WORK EQUIPMENT ASSESSMENT CHECKLIST (cont.)

	YES	NO	Is Action Required		Action Taken
			YES	NO	
Have all relevant Supervisor's been given suitable and sufficient training?					
Verbal					
Written					
Is the documentary evidence for the above available?					
Defect Reporting					
Is there a written defect reporting system?					
If "yes" are defects signed off when complete?					
Is there a system for taking defected equipment out of service if the defect poses a risk to safety?					
Are equipment users aware of defect reporting system?					
Is the documentary evidence for the above available?					

Appendix B –Confined Space and PRCS Recognition Checklist

Confined Space and PRCS Recognition Checklist

Part 1

- Is the space large enough so an staff can bodily enter and perform work?
- Does the space have limited or restricted means of entry and exit?
- Is the space not designed for continuous occupancy?

If the answer is yes to all items in Part I, continue to Part II. If the answer is no to any of the items in Part I, the space is not considered a confined space.

Part 2

- Does the space contain or potentially contain a hazardous atmosphere?
- Does the space contain any chemicals or chemical residues?
- Does the space contain any flammable/combustible substances?
- Does the space contain or potentially contain any decomposing organic matter?
- Does the space have any pipes which bring chemicals into it?
- Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?
- Is vision obscured by dust at 5 feet or less?
- Does the space contain any mechanical equipment servicing the space?
- Does the space have converging walls, sloped floors or tapered floor to smaller cross-sections which could trap or asphyxiate an entrant?
- Does the tank or vessel contains rusted interior surfaces?
- Does the space contains thermal hazards (e.g. cold, hot)?
- Does the space contain excessive noise levels which could interfere with communication with an attendant?
- Does the space presents any slip, trip, or fall hazards?
- Are there any operations conducted near the space opening which could present a hazard to the entrant?
- Are there any hazards from falling objects?
- Are there lines under pressure servicing the space?
- Are cleaning solvents or paints going to be used in the space?

- Is welding, cutting, brazing, riveting, scraping, or sanding going to be performed in the space?
- Is electrical equipment located in or required to be used in the space?
- Does the space have poor natural ventilation which would allow an atmospheric hazard to develop?
- Are there any corrosives which could irritate the eyes in the space?
- Are there any conditions which could prevent any entrant's self rescue from the space?
- Are there any substances used in the space which have acute hazards?
- Is mechanical ventilation needed to maintain a safe environment?
- Is air monitoring necessary to ensure the space is safe for entry due to a potential hazardous atmosphere?
- Will the entry be made into a dike area where the dike is 5 feet or more in height?
- Are residues going to be scraped off the interior surfaces of the vessel?
- Are non-sparking tools required to remove residues?
- Does the space restrict mobility to the extent that it could trap an irritant?
- Is respiratory protection required because of a hazardous atmosphere?
- Does the space present a hazard other than those noted above which would make it a permit space?

If any other questions in PART 2 have been checked yes, the confined space is a Permit-Required Confined Space (PRCS). As such, entry into these spaces must be performed under the protection of PRCS program.