Risk Management Manual
Table of Contents

Table of Contents .......................................................................................................................... 2
INTRODUCTION .............................................................................................................................. 4
INDUSTRIAL HYGIENE .................................................................................................................. 5
SAFETY AND HEALTH POLICY ............................................................................................... 6
SAFETY AND HEALTH LEGISLATION AND REGULATIONS ..................................................... 7
SAFE WORK ................................................................................................................................... 7
UNDERSTANDING THE RISK (Proactive Safety) ...................................................................... 8
CARDINAL RULES ....................................................................................................................... 9
SAFETY MEETINGS .................................................................................................................... 9
DEFINITIONS ............................................................................................................................... 10
ABRASIVE WHEEL Equipment-grinders CHECKLIST .................................................................. 10
ACCIDENT, INCIDENT REPORTING AND INVESTIGATING ...................................................... 11
BLOODBORNE PATHOGENS CHECKLIST for First Responders, EMT’s, and Facilities Maintenance Personnel .................................................................................................................. 11
CHEMICAL SAFETY .................................................................................................................. 12
COMPRESSED GAS CYLINDERS CHECKLIST .......................................................................... 13
COMPRESSORS AIR RECEIVERS CHECKLIST ........................................................................... 14
COMPRESSORS AND COMPRESSED AIR CHECKLIST ............................................................... 14
CONFINED SPACES .................................................................................................................. 15
CONFINED SPACES CHECKLIST FOR ENTERING ..................................................................... 19
CONTROL OF HARMFUL SUBSTANCES BY VENTILATION CHECKLIST ..................................... 20
CRYOGENIC LIQUIDS ................................................................................................................ 20
DEMACRATION ........................................................................................................................... 22
ELECTRICAL SAFETY ................................................................................................................ 22
ELECTRICAL CHECKLIST ........................................................................................................ 23
ELEVATED SURFACES CHECKLIST .......................................................................................... 25
EMERGENCY FIRST AID AND MEDICAL SERVICES ................................................................. 25
EMPLOYER POSTING CHECKLIST ........................................................................................... 27
ENVIRONMENTAL CONTROLS CHECKLIST ............................................................................ 27
EXIT DOORS CHECKLIST .......................................................................................................... 29
EXITING OR EGRESS CHECKLIST ............................................................................................. 29
EYE AND FACE PROTECTION ................................................................................................... 30
FALL PROTECTION .................................................................................................................... 32
FIRE PREVENTION AND PROTECTION .................................................................................... 32
FIRE PROTECTION CHECKLIST ............................................................................................... 33
FIRE extinguisher: HOW TO OPERATE ...................................................................................... 34
FIRST AID CHECKLIST AND MEDICAL SERVICES ................................................................. 34
FIRST AID SUPPLIES ............................................................................................................... 35
FIXED LADDERS ....................................................................................................................... 36
FLAMMABLE AND COMBUSTIBLE MATERIALS CHECKLIST .................................................. 36
FLOOR AND WALL OPENINGS CHECKLIST ............................................................................. 37
FOOD SAFETY ............................................................................................................................ 38
FOOT PROTECTION ................................................................................................................... 42
FUELING CHECKLIST ............................................................................................................... 43
GENERAL WORK ENVIRONMENT CHECKLIST ........................................................................ 43
HAND AND PORTABLE POWERED TOOLS ............................................................................... 44
HAND TOOLS AND EQUIPMENT CHECKLIST FOR MANAGERS OR SUPERVISORS .................. 45
HAZARDOUS CHEMICAL EXPOSURE CHECKLIST ................................................................. 46
HAZARDOUS SUBSTANCES COMMUNICATION CHECKLIST .................................................. 46
HOIST AND AUXILIARY EQUIPMENT CHECKLIST .................................................................. 47
HOUSEKEEPING ....................................................................................................................... 48
HYDRAULIC SYSTEMS .............................................................................................................. 49
INDUSTRIAL TRUCKS – FORKLIFTS CHECKLIST .................................................................... 50
KEEP YOUR BACK INJURY FREE .............................................................................................. 50
LADDER SAFETY ...................................................................................................................... 51
LASERS ......................................................................................................................................... 52
LIFTING GEAR, BOOMS AND CRANES ..................................................................................... 53
LOCKOUT / TAG OUT PROCEDURES CHECKLIST .................................................................... 54
LOCKOUT, TAG OUT, TRYOUT, FOR YOUR PROTECTION ......................................................... 55
MACHINE GUARDING CHECKLIST .......................................................................................... 56
MACHINE SAFETY .................................................................................................................... 56
MATERIAL HANDLING CHECKLIST ............................................................................................ 57
MEANS OF EGRESS ................................................................................................................... 58
MOBILE EQUIPMENT AND FORK TRUCKS ................................................................................. 59

Revision 4, August 2010   Page 2 of 90
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOTOR VEHICLE SAFETY</td>
<td>60</td>
</tr>
<tr>
<td>NOISE – HEARING PROTECTION</td>
<td>63</td>
</tr>
<tr>
<td>NOISE CHECKLIST</td>
<td>64</td>
</tr>
<tr>
<td>PERSONAL PROTECTIVE EQUIPMENT [PPE]</td>
<td>64</td>
</tr>
<tr>
<td>PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING CHECKLIST</td>
<td>65</td>
</tr>
<tr>
<td>PIPING SYSTEMS CHECKLIST</td>
<td>66</td>
</tr>
<tr>
<td>PORTABLE LADDER CHECKLIST</td>
<td>66</td>
</tr>
<tr>
<td>PORTABLE (POWER OPERATED) TOOLS AND EQUIPMENT CHECKLIST</td>
<td>67</td>
</tr>
<tr>
<td>POWDER–ACTUATED (EXPLOSIVE) FASTENING TOOLS</td>
<td>68</td>
</tr>
<tr>
<td>POWDER-ACTUATED TOOLS CHECKLIST</td>
<td>68</td>
</tr>
<tr>
<td>POWER DISTRIBUTION SAFETY</td>
<td>68</td>
</tr>
<tr>
<td>RECORDKEEPING CHECKLIST</td>
<td>75</td>
</tr>
<tr>
<td>SAFE WORK</td>
<td>75</td>
</tr>
<tr>
<td>A SAFE WORK ENVIRONMENT</td>
<td>76</td>
</tr>
<tr>
<td>SAFETY AND HEALTH LEGISLATION AND REGULATIONS</td>
<td>77</td>
</tr>
<tr>
<td>SAFETY AND HEALTH POLICY</td>
<td>77</td>
</tr>
<tr>
<td>SAFETY AND HEALTH PROGRAM CHECKLIST-Managers</td>
<td>78</td>
</tr>
<tr>
<td>SANITIZING EQUIPMENT AND CLOTHING CHECKLIST</td>
<td>78</td>
</tr>
<tr>
<td>SECURITY</td>
<td>78</td>
</tr>
<tr>
<td>SMOKING POLICY</td>
<td>80</td>
</tr>
<tr>
<td>SPRAYING OPERATIONS CHECKLIST</td>
<td>80</td>
</tr>
<tr>
<td>STACKING AND STORAGE</td>
<td>80</td>
</tr>
<tr>
<td>STAIRS AND STAIRWAYS CHECKLIST</td>
<td>81</td>
</tr>
<tr>
<td>TIRE INFLATION CHECKLIST</td>
<td>81</td>
</tr>
<tr>
<td>TIRE SERVICE</td>
<td>82</td>
</tr>
<tr>
<td>TRANSPORTING EMPLOYEES AND MATERIALS CHECKLIST</td>
<td>82</td>
</tr>
<tr>
<td>VENTILATION</td>
<td>83</td>
</tr>
<tr>
<td>WALKWAY CHECKLIST</td>
<td>84</td>
</tr>
<tr>
<td>WALKWAYS, ELEVATED SURFACES, FLOOR AND WALL OPENINGS, STAIRS AND STAIRWAYS</td>
<td>84</td>
</tr>
<tr>
<td>WELDING, CUTTING AND BRAZING</td>
<td>85</td>
</tr>
<tr>
<td>WELDING, CUTTING AND BRAZING CHECKLIST</td>
<td>88</td>
</tr>
</tbody>
</table>
INTRODUCTION

The intent of this manual is to minimize loss due to accidents, increase the work skills and safety knowledge of all employees, and help the company operate in compliance with state and federal regulations.

This manual has been developed from the experience of many people, through publications available from OSHA, other regulatory authorities, and other references. It is not all-inclusive and serves as a guide. You will find useful checklists throughout this manual to help you comply with company policy and regulatory requirements. Some topics may not apply to your work, after the introductory sections, specific topics are in alphabetical order to help you find topics that do apply.

This manual is available online at http://www.noao.edu/noaolocal/safety/. Employees are encouraged to become familiar with this manual and the work activities addressed therein. Questions, comments and suggestions concerning this manual should be directed to the Risk Management Office in Tucson at extension 8211, or 520-318-8211.
INDUSTRIAL HYGIENE

Industrial Hygiene is an essential component of the company’s safety and health system. The goal is to prevent occupational disease or injury through the recognition, evaluation, and control of occupational health hazards.

Industrial illness may arise from the exposure to noise, dusts, gasses, chemicals, radiation, etc. These exposures, at certain levels, can result in industrially induced illnesses and disease. The health effect may be immediate or may take years to develop. We are concerned about your health, as well as your physical safety at work. We must all share the responsibilities of maintaining a work place where the risks of occupational disease are controlled.

Each employee is responsible for contributing his or her part towards the success of the industrial hygiene program. This includes the following:

- To notify the supervisor immediately when conditions or practices can cause personal injury or property damage that you cannot correct due to lack of resources and/or training.
- To observe all safety and health rules and to make maximum use of all prescribed personal protective equipment, and to follow practices and procedures established to maintain health and safety.
- To report immediately an accidental exposure to harmful chemicals or materials.
- To practice good habits of personal hygiene and housekeeping.

Knowledge is the key in protecting your health and safety. Learn about the potential health risks in your work environment through formal and informal classes and meetings. In addition, safety and health standards provide information directed toward maintaining a safe and healthy work place. The education and training will provide you with information on the following:

- Identification of the health risks - what is out there, how much, and how much exposure risk.
- Where to find additional information on hazardous substances, such as material safety data sheets.
- How to safely handle materials that could be harmful.
- What to do in the case of an emergency.
- Provides you the opportunity for discussion and questions.
- Describes what steps your employer is taking to protect you health.
- Describes what steps you can take to protect yourself, your fellow employee, and your family.

Personal monitoring surveys may be required to gain knowledge on exposure levels of potentially harmful substances in the workplace. If requested, your cooperation in these surveys is necessary. In addition, your input during a survey may provide information leading to a better solution.

Providing and maintaining a safe and healthful work environment is the responsibility of all employees. The goal is to anticipate, recognize, evaluate and control work-related health risks.
SAFETY AND HEALTH POLICY

Good safety practices are an integral part of the organization’s activities and are established by executive management.

NOAO/NSO is committed to providing employees and guests with a safe and healthy work environment. In pursuit of this goal, managers and supervisors are tasked with ensuring that work, conducted in their area, does not pose a potential risk to the health and well being of the assigned personnel.

Employees of NOAO/NSO also have a key role in this program by maintaining a safety conscious work attitude. Unsafe conditions or health and safety concerns should be reported to the supervisor or the NOAO/NSO Risk Management Office immediately. Employees involved in an activity that could reasonably be considered to pose a serious threat to life or health have the right, under OSHA regulations, to cease work until the condition can be reviewed and abated.

To support the Health and Safety Policy, the following are established and proven safe operating objectives:

- All accidents are preventable.
- Safety is a value associated with every priority.
- Prevention is our focus.
- Compliance without compromise to regulatory standards.
- Employee involvement is key to continuous improvement in safety performance.
- No job is so important that it will be done at the expense of your safety.
- Make safety communication a part of our daily activities.
- To create a partnership with our customers, visitors and suppliers in safety and health management.
SAFETY AND HEALTH LEGISLATION AND REGULATIONS

NOAO/NSO acknowledges that both Federal and State legislation and regulations are designed to ensure that employers provide a safe and healthy workplace and that employees use the safety devices provided and follow the safety rules and procedures. In summary, SAFETY LAWS ARE FOR YOUR PROTECTION!

OSHA’s [Occupational Safety and Health Act of 1970] objective can be summarized as follows:

“...to assure as far as possible every working man and woman in the nation safe and healthful working conditions, and to preserve our human resources.”

The Occupational Safety and Health Administration [OSHA], work with companies to assure a safe and healthy work environment for employees. They set safety standards and procedures for employees to follow to make the company a safer organization.

As an employee of the company, it is your responsibility to learn and follow these standards and procedures.

SAFE WORK

NOAO/NSO’s management is committed to improve the safety and health of all employees. Safety standards, rules and regulations apply to all employees, contractors and visitors. Everyone shares the responsibility to work safely by following rules, procedures and standards. Everyone shares the responsibility to prevent accidents.

We are committed, and are constantly striving to provide a safe and healthy work environment for all. Safety is a value, linked with every priority and we have safety systems in place to make this a reality. You are the key to making our safety system a success and your involvement, participation and support are vital to this success. We are serious about your safety, are you?

How can you help?

Read this document, it contains valuable information, guidelines and checklists to help create a safe work environment and safe work habits. Constantly refer to it when you are uncertain about any safety issue.

If you are a new to the NOAO/NSO, we welcome you and wish you a long, happy and safe career with us. If you are a seasoned employee, we thank you for your contributions to safety and hope that the information contained in this manual will further assist you to continue being a safe employee.

Follow the safety rules and procedures at all times and if you are ever in doubt, ask. Wear your personal protective equipment, as required, all the time.

Report all injuries and property damage accidents and, most important, near misses. Investigating these events will lead to the elimination of similar occurrences.

Always practice good housekeeping habits. Remember, the foundation of a good safety program is good housekeeping, which is:
A PLACE FOR EVERYTHING AND EVERYTHING IN ITS PLACE, ALWAYS.

Encourage your fellow employees to observe safety rules and procedures.

UNDERSTANDING THE RISK (Proactive Safety)

Hazards must be recognized before you can do anything about managing them. One way that you can do this is by always thinking about what could go wrong, so you can predict what could happen under slightly different circumstances. The key to proactive safety is not what happened, but what COULD happen!

Ask Yourself:

- What situations or actions could cause trouble?
- Could anything spill or catch fire?
- Could someone fall or trip?
- How can I correct this hazard, or report it to someone who can have it corrected?
- Should I be doing this?
- Did I leave a safety trap for someone else?
- Is there a procedure for this; is it being followed?
- Is this a critical task? Am I aware of the critical steps?
- Am I overexerting myself?
- Can I fall? Do I need help?
- Am I authorized to operate this?
- What more can I do to make this situation safe?
- Is a short cut really worth the risk? Think about it!

You have the legal right and responsibility to have hazardous conditions corrected.

To help keep you safe NOAO/NSO and the Office of Risk Management will:

- Provide information about the risks that you may encounter on the job.
- Identify potential causes of job-related injury, disease or illness.
- Provide safety training, when necessary.
- Explain procedures, equipment and actions that you should take to reduce hazards and risks so that you can perform jobs safely.
- Provide and [in some instances] maintain personal protective equipment [PPE].
- Ensure emergency and first aid plans are in place and available.
- Allow sufficient opportunity for safety meetings and discussions.
- Make the necessary material safety data sheets [MSDS’s] and written safe work procedures readily available.
• Value safety and health in everything that we do.

• Have management staff that can assist to you in being safe at work by guiding, educating, training and inspiring you in all aspects of managing risks.

• Provide leadership to ensure your safety at work.

CARDINAL RULES

No safety standard, procedures or rule should ever be broken, because they represent our commitment to the safety and health of our employees. Standards, procedures or rules that are broken may have more severe consequences than others. Employees may be reprimanded, given disciplinary time off or discharged as the circumstances warrant. The following rules are called the CARDINAL SAFETY RULES and a breach of any of these nine rules will lead to severe disciplinary action up to and including dismissal irrespective of whether the breach led to an injury or not:

• Fighting for any reason. It is not tolerated.
• Working while intoxicated, being at work under the influence of intoxicating liquor or drugs.
• Removing a lock-out lock or tag without authorization.
• Failing to lock, tag and try out [test] energy systems when required by policy.
• Committing an intentional act or situation that demonstrates reckless disregard for your safety and/or the safety of others.
• Repeated failure or unwillingness to abide safety rules and regulations.
• Making false statements in the course of an accident investigation or while undergoing a physical examination.
• Removing, interfering with, defacing or destroying any safety device.
• Possession of firearms or explosives while on company property without permission.

Remember that some prescription drugs may make you feel drowsy or affect your reaction time. This may create a hazardous situation if you operate machinery or vehicles. If you are on prescription medication, get medical advice as to whether or not you can come to work if the medication has such side effects. Confidential assistance can be arranged for employees with alcohol or drug related problems.

SAFETY MEETINGS

Safety meetings should be conducted regularly in each department to keep everyone informed and aware of current safety issues, and for providing ongoing safety training. Formal meetings and training are sometimes required by law. These meetings provide the time for all to focus on safety and to discuss any safety concerns that have not been previously addressed. We expect all to attend and to participate in these meetings. These meetings are opportunities to discuss safety issues and problems, as well as to propose possible solutions. A safety meeting is an ideal opportunity to ask for clarity on issues of safety. Recall safety incidents and near misses at these meeting so that others can learn about what happened, or could have happened. Use the topics in this manual for safety meetings and make sure that there is a sign in sheet.
DEFINITIONS

These are a few of the different terms used in our safety system, please familiarize yourself with them:

- **Safety**: Safety is the control of accidental loss.
- **Accident**: An accident is an undesired event that causes injury and/or property damage and/or business interruption.
- **Incident \ Near Miss**: An incident is an undesired event, which, under slightly different circumstances, could have caused injury to people, damage to property, or business interruption.
- **Injury**: Physical harm to the body because of contact with a source of energy greater than the threshold limit of the body.
- **Occupational Disease**: An occupational disease is any disease or illness, which arises out of and during the course of normal employment.
- **Reportable or Recordable Injury**: A reportable or recordable injury is any injury or disease which arises out of or during the course of normal employment and which is required to be reported or recorded to the authorities as determined by Legislation [OSHA or other laws]. The employee and the supervisor has the responsibility to report the injury to the Risk Management Department. The Risk Management Department will report the injury to OSHA if required.

ABRASIVE WHEEL EQUIPMENT-GRINDERS CHECKLIST

- Is the work rest used and kept adjusted to within 1/8 inch (0.32 centimeters) of the wheel?
- Is the adjustable tongue on the topside of the grinder used and kept adjusted to within ¼ inch or 0.635 centimeters of the wheel?
- Do side guards cover the spindle, nut, flange, and 75% of the wheel diameter?
- Are bench and pedestal grinders permanently mounted?
- Are goggles or face shields always worn when grinding?
- Is the maximum RPM rating of each abrasive wheel compatible with the RPM rating of the grinder motor?
- Are fixed or permanently mounted grinders connected to their electrical supply system with metallic conduit or other permanent wiring method?
- Does each grinder have an individual on and off control switch?
- Is each electrically operated grinder effectively grounded?
- Before new abrasive wheels are mounted, are they visually inspected and ring tested?
- Are dust collectors and powered exhausts provided on grinders used in operations that produce large amounts of dust?
- Are splashguards mounted on grinders that use coolant to prevent the coolant-reaching employees?
- Is cleanliness maintained around grinders?
ACCIDENT, INCIDENT REPORTING AND INVESTIGATING

Injuries caused by accidents in the workplace are a major source of pain, suffering and expense. We do not want you to be injured while at work and we will do all we can to create a safe work environment.

If you are involved in an accident at work and are injured, you are required to do the following:

- Notify your manager or supervisor immediately.
- Seek medical attention as directed.
- Follow all the instructions issued by the medical attendant concerning ongoing treatment.
- Even if you feel that the injury is insignificant, report it nevertheless. Sprains and strains are sometimes worse on the day following the event.
- Participate in the investigation of the accident so those steps to prevent a recurrence can be taken.

Should you be involved in an accident that causes any form of loss or injury, report it so that it can be investigated and a recurrence of the same type of accident can be prevented. Should you witness a near miss [incident] report it as well. Under slightly different circumstances, it may have caused injury.

Things to remember about accident and incident reporting:

- Accident reporting forms are available from management, administrative assistant or immediate supervisor.
- To report a near miss, at risk behavior, unsafe conditions, names and identities of the reporter or people involved are not required.
- Report all near misses to your manager or immediate supervisor.
- Remember that the only difference between an accident and a near miss is the consequence.
- All property damage, business interruption and injury causing accidents must be reported immediately.
- Accidents can only be prevented if they are reported.
- Report all personal injuries as soon as possible; even if you think it is not serious, it may worsen with time.

You may be asked to participate in an accident investigation, if so remember that accident investigation is Fact Finding and not Fault Finding.

BLOODBORNE PATHOGENS CHECKLIST for First Responders, EMT’s, and Facilities Maintenance Personnel.

The definition for blood-borne pathogens is a disease-causing micro-organisms that are transmitted through blood and other bodily fluids. Examples are HIV-AIDS and Hepatitis B.

Does the employee-training program on the blood-borne pathogens standard contain the following elements?

- An accessible copy of the standard and an explanation of its contents?
- A general explanation of the epidemiology and symptoms of blood-borne diseases?
An explanation of the modes of transmission of blood-borne pathogens?

An explanation of the employer’s exposure control plan and the means by which employees can obtain a copy of the written plan?

An explanation of the appropriate methods for recognizing tasks and the other activities that may involve exposure to blood and other potentially infectious materials?

An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices and personal protective equipment?

Information on the types, proper uses, location, removal, handling, decontamination and disposal of personal protective equipment?

An explanation of the basis for selection of personal protective equipment?

Information on the hepatitis B vaccine?

Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials?

An explanation of the procedure to follow if an exposure incident occurs, including the methods of reporting the incident and the medical follow up that will be made available?

Information on post exposure evaluations and follow up?

An explanation of signs, labels and color-coding?

CHEMICAL SAFETY

Every employer who uses hazardous chemicals is required to have an effective program to control use, access, storage and disposal of chemicals. Information about the risks of using or misusing chemicals is available from manufacturers and suppliers through Material Safety Data Sheets (MSDS). This information can be used to provide the engineering, protective equipment and procedures needed to safeguard employees.

A material is generally defined as hazardous when it has one or more of the following characteristics:

- Its flashpoint is below 140° F (60° C) or it is subject to spontaneous heating.
- It has a threshold limit value below 500 parts per million for gases or vapors, below 500 milligrams per cubic meter (mg/M³) for fumes and below 25 million particles per cubic foot for dusts, or a single oral lethal dose (LD) below 500 milligrams per kilogram.
- It is subject to polymerization with the release of large amounts of energy.
- It is a strong oxidizing or reducing agent, or can cause first-degree burns to the skin on brief exposure or is systemically toxic by skin contact.
- It may produce, in the course of normal operations, dusts, gases, fumes, vapors, mists or smoke with one or more of the above characteristics.

Users of the chemicals shall obtain Material Safety Data Sheets (MSDS) from the suppliers. These sheets tell how to protect employees, property and the environment through proper use, storage and disposal of chemicals. Manufacturers provide material safety data sheets to inform users about products, and encourage controls that will
protect manufacturer and user against financial loss due to a preventable accident. Strict observation of the following general guidelines greatly reduces the probability of accidents during the transportation, storage and use of hazardous chemicals:

- Smoking, eating and drinking in areas where chemicals are stored or used is prohibited.
- Keep all containers closed and drums sealed;
- If a container leaks, prevent the spread of the material leaking, inform management and the Risk Management Office and clean up the spill per the MSDS and other guidance.
- Label containers properly and keep chemicals in their original containers.
- Dispose of chemical containers by following written procedures consistent with municipal, county, state and federal regulations.
- Keep incompatible chemicals physically apart.

**Transporting Hazardous Materials**

The transportation of hazardous materials in the United States is regulated by the Department of Transportation. The movement of such hazardous items in any quantity requires the driver to have a Hazardous Materials Endorsement on his/her license and must be accompanied by the proper shipping documents.

In order to produce the proper shipping documents, Shipping and Receiving department must have a Materials Safety Data Sheet (MSDS) for each hazardous material to be transported and ensure that that document is transmitted to and registered with a national MSDS clearing house. Registering the MSDS document with the clearinghouse may take up to 4 days. Once the MSDS is registered; there is no need to repeat the 4-day registration process for following shipments of the same hazardous material, proper shipping methods would still apply.

Hazardous materials as defined by the Department of Transportation include, but are not limited to, all aerosols, bottled gasses, cryogens, adhesives and non-latex paints and coatings. All flammable, corrosive, toxic and explosive liquids are considered hazardous materials without regard to the quantities shipped. Formal listing is as follows:

1. Explosives (classes 1.1, 1.2, and 1.3)
2. Poison Gas (class 2.3)
3. Dangerous when Wet (class 5.3)
4. Organic Peroxides, Type B, Temperature controlled (class 4.3)
5. Poison Inhalation Hazard, Zone A or B (class 6.1)
6. Radioactive Materials requiring a Yellow III label (class 7)

If you intend to or know of any visitor that intends to use any of the above classifications of hazardous materials, contact the Shipping and Receiving Department or the Risk Management Department before ordering or having the items shipped.

**COMPRESSED GAS CYLINDERS CHECKLIST**

- Are cylinders with water weight capacity over 30 pounds (13.5 kilograms), equipped with means for connecting a valve protector device, or with a collar or recess to protect the valve?
- Are cylinders legibly marked to clearly identify the gas contained?
☐ Are compressed gas cylinders stored in areas that are protected from external heat sources such as flame impingement, intense radiant heat, electric arcs, or high temperature lines?

☐ Are cylinders stored or transported in a manner to prevent them from creating a hazard by tipping, falling, or rolling?

☐ Are cylinders containing liquefied fuel gas, stored or transported in a position so that the safety relief device is always in direct contact with the vapor space in the cylinder?

☐ Are valve protectors always placed on cylinders when the cylinders are not in use or connected for use?

☐ Are all valves closed off before a cylinder is moved, when the cylinder is empty, and at the completion of each job?

☐ Are low-pressure fuel-gas cylinders checked periodically for corrosion, general distortion, cracks, or any other defect that might indicate a weakness or render it unfit for service?

☐ Does the periodic check of low-pressure fuel-gas cylinders include a close inspection of the cylinders’ bottom?

**COMPRESSORS AIR RECEIVERS CHECKLIST**

☐ Is every receiver equipped with a pressure gauge and with one or more automatic, spring-loaded safety valves?

☐ Is the total relieving capacity of the safety valve capable of preventing pressure in the receiver from exceeding the maximum allowable working pressure of the receiver by more than 10 percent?

☐ Is every air receiver provided with a drainpipe and valve at the lowest point for the removal of accumulated oil and water?

☐ Are compressed air receivers periodically drained of moisture and oil?

☐ Are all safety valves tested frequently and at regular intervals to determine whether they are in good operating condition?

☐ Does the Division of Occupational Safety and Health use a current operating permit?

☐ Is the inlet of air receivers and piping systems kept free of accumulated oil and carbonaceous materials?

**COMPRESSORS AND COMPRESSED AIR CHECKLIST**

☐ Are compressors equipped with pressure relief valves and pressure gauges?

☐ Are compressor air intakes installed and equipped to ensure that only clean uncontaminated air enters the compressor?

☐ Are air filters installed on the compressor intake?

☐ Are compressors operated and lubricated in accordance with the manufacturer’s recommendations?

☐ Are safety devices on compressed air systems checked frequently?

☐ Before any repair work is done on the pressure system of a compressor, is the pressure bled off and the system locked-out?
Are signs posted to warn of the automatic starting feature of the compressors?

Is the belt drive system totally enclosed to provide protection for the front, back, top and sides?

Is it strictly prohibited to direct compressed air towards a person?

Are employees prohibited from using highly compressed air for cleaning purposes?

If compressed air is used for cleaning off clothing, is the pressure reduced to less than 10 psi?

When using compressed air for cleaning, do employees wear protective chip guarding and personal protective equipment?

Are safety chains or other suitable locking devices used at couplings of high-pressure hose lines where a connection failure would create a hazard?

Before compressed air is used to empty containers of liquid, is the safe working pressure of the container checked?

When compressed air is used to inflate auto tires, is a clip-on chuck and an inline regulator preset to 40 psi required?

Is it prohibited to use compressed air to clean up or move combustible dust if such action could cause the dust to be suspended in the air and cause a fire or explosion hazard?

CONFINED SPACES

The condition of a confined space should always be determined in advance of entry and appropriate action taken to safeguard workers in the area. A confined space generally is any enclosed space in which air is not being changed continually by natural circulation. Confined spaces include boilers, storage vessels, furnaces, railroad tank cars, manholes, and cooking and process vessels, among other spaces.

Confined space - A confined space is defined as an area which:

- Has adequate size and configuration for employee entry,
- Has limited means of access or egress; and
- Is not designed for continuous employee occupancy.

"OSHA notes that doorways and other portals through which a person can walk are not to be considered limited means for entry or exit. However, a space containing such a door or portal may still be deemed a confined space if an entrant's ability to escape in an emergency would be hindered."

The hazards in a confined space may be lack of oxygen or asphyxiating atmospheres, explosive or toxic gases, vapor or dust, engulfment from small particles or exposure to temperature extremes, which may cause immediate health or safety risks, these are classified as "permit-required" confined spaces. All permit-required spaces must be identified to prevent unauthorized entry and protect trained authorized employees from hazards through a permit confined space program.

These procedures should be included in an overall plan to safeguard entering or working in confined spaces:
Employees should not enter any confined space without knowing what was in it, what is in it now, how long it has been closed, and what precautions should be taken.

Close and lock all valves and switches connected with the operation of the confined space to prevent accidental introduction of contaminants, live steam, hot water, or starting of equipment within the space when it is occupied.

Test the atmosphere in the area with direct-reading airborne gas/vapor analyzer, an Explosimeter® or combustible gas detector, and an oxygen deficiency indicator. Purge an explosive or flammable atmosphere, taking extreme care to avoid all sources of ignition. Ground purging lines and use non-sparking tools and explosion-proof electrical equipment and lighting. Retest the atmosphere after purging.

Purge the area, as necessary, with steam, water, compressed air or fresh air. Retest the atmosphere after purging. If the area cannot be purged, inform employees of the hazards and tell them what procedures must be followed.

A means of communication between the employee and the outside should be provided since the employee may suddenly begin to feel distress and not be able to summon help. Monitor the space with appropriate instruments while work continues. An employee entering a hazardous atmosphere should wear a supplied-air respirator or self-contained breathing apparatus, a safety harness and a lifeline. A lifeline should be constantly held by another employee in a back-up position who is also equipped with self-contained breathing apparatus, safety harness and lifeline. This second employee should constantly watch the employee in the confined space. An employee, within sight and hearing of the area, should be told that others are entering the confined space.

The two standby employees should be well trained in rescue techniques, first aid and resuscitation. Respirators, of either the supplied-air or self-contained type, must be immediately available for use by the rescue employees. If the employee in the confined space does not normally use a respirator, one should be available for him as well.

A qualified tester should determine that the area is free of any combustible gas before any welding or cutting is done. All regulations for welding or cutting should be followed. Use mechanical ventilation to remove vapors from the space.

Avoid the possibility of heat exposure by providing adequate ventilation or by cooling with portable air conditioning or by periods of rest in cooler air outside the space.
Confined Space Entry Permit (page 1 of 2)

<table>
<thead>
<tr>
<th>Location of Confined Space:</th>
<th>Date/Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose of Entry:</td>
<td>Duration:</td>
</tr>
<tr>
<td>Authorized By:</td>
<td>Expires On:</td>
</tr>
<tr>
<td>Attendant(s):</td>
<td>Permit Valid For One Shift Only</td>
</tr>
<tr>
<td>Standby Person(s):</td>
<td></td>
</tr>
</tbody>
</table>

**Authorized Entrants: (List Others on Back of Form)**

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
</table>

**Measures For Isolating & Equipment**

<table>
<thead>
<tr>
<th>Measures For Isolating &amp; Equipment</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock Out-De-Energize-Try-Out Equipment</td>
<td>Self Contained Breathing Apparatus SCBA</td>
<td></td>
</tr>
<tr>
<td>Line(s) Broken-Capped-Blanked</td>
<td>Air-Line Respirators w/Emergency-Escape Capability</td>
<td></td>
</tr>
<tr>
<td>Purge-Flush and Vent</td>
<td>Resuscitator/ inhaler</td>
<td></td>
</tr>
<tr>
<td>Secure Area (Post and Flag)</td>
<td>Communications Equipment</td>
<td></td>
</tr>
<tr>
<td>Full Body Harness with &quot;D&quot; Ring</td>
<td>Protective Clothing</td>
<td></td>
</tr>
<tr>
<td>Tripod Emergency Escape Unit</td>
<td>Head/Eye/Hearing Protection (circle</td>
<td></td>
</tr>
<tr>
<td>Lifelines</td>
<td>Hot Work Permit Required</td>
<td></td>
</tr>
<tr>
<td>Fire Extinguishers</td>
<td>Air Purifying Respirators and cartridges</td>
<td></td>
</tr>
<tr>
<td>Lighting (Explosion-Proof)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ATMOSPHERE MONITORING**

<table>
<thead>
<tr>
<th>Test(s) to be Taken</th>
<th>Acceptable Entry Conditions (Circle Appropriate Level)</th>
<th>Yes</th>
<th>No</th>
<th>TLV*</th>
<th>PEL**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Date/Time</td>
<td>Date/Time</td>
<td>Date/Time</td>
<td>Date/Time</td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
<td>&gt;19.5&lt;23.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combustible Gas</td>
<td>Below 10% LEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>0-25 PPM</td>
<td>0-50 PPM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>0-10 PPM</td>
<td>0-10 PPM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Individual Conducting Test (name):**

**Any Questions Pertaining to Test Requirements, Contact:**

<table>
<thead>
<tr>
<th>Instrument Used</th>
<th>Name</th>
<th>Type</th>
<th>Identification Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For Rescue & Emergency Services Call Extension 911

**Entry Supervisor Authorizing All Above Conditions Satisfied:**

**Rescue Team Advised of Confined Space Entry (Yes), (No):**

**Person Contacted of the Rescue Team:**

**Time and Date of Person Contacted of the Rescue Team:**

**Time & Date Rescue Team Released:**

**Person Contacted of the Rescue Team:**

Confined Space Entry Permit (page 2 of 2)
CONFINED SPACES CHECKLIST FOR ENTERING

☐ Are confined spaces thoroughly emptied of any corrosive or hazardous substances, such as acids or caustics, before entry?

☐ Are all lines to a confined space, containing inert, toxic, flammable, or corrosive materials valved off and blanked or disconnected and separated before entry?

☐ Are all impellers, agitators, or other moving parts and equipment inside confined spaces locked-out if they present a hazard?

☐ Is either natural or mechanical ventilation provided before confined space entry?

☐ Are appropriate atmospheric tests performed to check for oxygen deficiency, toxic substances and explosive concentrations in the confined space before entry?

☐ Is adequate illumination provided for the work to be performed in the confined space?

☐ Is the atmosphere inside the confined space frequently tested or continuously monitored during conduct of work?

☐ Is there an assigned safety standby employee outside of the confined space, when required, whose sole responsibility is to watch the work in progress, sound an alarm if necessary, and render assistance?

☐ Are all participating employees properly trained?

☐ Is the standby employee appropriately trained and equipped to handle an emergency?

☐ Is the standby employee or other employees prohibited from entering the confined space without lifelines and respiratory equipment if there is any question as to the cause of an emergency?

☐ Is approved respiratory equipment required if the atmosphere inside the confined space cannot be made acceptable?

☐ Is all portable electrical equipment used inside confined spaces either grounded and insulated or equipped with ground fault protection?

☐ Before gas welding or burning is started in a confined space, are hoses checked for leaks, compressed gas bottles forbidden inside of the confined space, torches lighted only outside of the confined space and the confined space tested for an explosive atmosphere each time before a lighted torch is to be taken into the confined space?

☐ If employees will be using oxygen-consuming equipment, such as salamanders, torches and furnaces in a confined space, is sufficient air provided to assure combustion without reducing the oxygen concentration of the atmosphere below 19.5 percent by volume?

☐ Whenever combustion type equipment is used in a confined space, are provisions made to ensure the exhaust gases are vented outside of the enclosure?

☐ Is each confined space checked for decaying vegetation or animal matter, which may produce methane?

☐ Is the confined space checked for possible industrial waste, which could contain toxic properties?
If the confined space is below the ground and near areas where motor vehicles will be operating, is it possible for vehicle exhaust or carbon monoxide to enter the space?

**CONTROL OF HARMFUL SUBSTANCES BY VENTILATION CHECKLIST**

- Is the volume and velocity of air in each exhaust system sufficient to gather the dusts, fumes, mists, vapors or gases to be controlled and to convey them to a suitable point of disposal?
- Are exhaust inlets, ducts and plenums – manifolds designed or a confined space, constructed and supported to prevent collapse or failure of any part of the system?
- Are clean out ports or doors provided at intervals not to exceed 12 feet (3.66 meters) in all horizontal runs of exhaust ducts?
- Where two or more different type of operations are being controlled through the same exhaust system, will the combination of substances being controlled constitute a fire, explosion or chemical reaction hazard in the duct?
- Is adequate make up air provided to areas where exhaust systems are operating?
- Is the source point for make up air located so that only air which is free of contaminates, will enter the work environment?
- Where two or more ventilation systems are serving a work area, is their operation such that one will not offset the functions of the other?

**CRYOGENIC LIQUIDS**

Hazards associated with cryogenic liquids include frostbite, material and construction compatibility, high pressure, explosions, implosions, toxicity, asphyxiation, skin lesions and vision impairment.

**Health Hazards**

Frostbite/burns from cryogenic liquids may be severe where the liquid pools, such as under an eyelid, in a cupped palm, or in a sleeve or cuff. Exposure to cryogenic liquids can cause blindness if the cornea becomes frozen. Bare skin can instantly bond with unprotected supply lines or un-insulated equipment and may tear when pulled away, causing skin lesions.

When cryogenic liquids are spilled in a small area, the liquid will evaporate and expands rapidly displacing breathing air and may cause asphyxiation. Cold gases and gases that are heavier than air concentrate in low places where ventilation is poor, such as sumps or pits.

**Design Considerations**

Equipment and systems designed for the storage, transfer, and dispensing of cryogenic fluids shall be constructed of materials compatible with the products being handled and the temperatures encountered. Some materials become brittle at low temperatures. Brittle fracture can occur rapidly resulting in failure. Low temperature equipment can also fail due to thermal stresses caused by differential thermal contraction of the materials. Over pressurization of cryogenic equipment can occur due to the phase change from liquid to gas if not vented properly. All cryogenic
systems, including piping, must be equipped with pressure-relief devices to prevent excessive pressure build-up. Pressure-relief devices must be directed to a safe location.

When designing cryogenic systems refer to ASME Codes B31.1 through B31.7, Compressed Gas Association, Inc. documents and the ASTM handbook provides information concerning tensile strength of metals at various temperatures and other information.

Special Considerations for our most frequently used cryogenic liquids:
Liquid helium must be transferred via helium pressurization in properly designed transfer lines. A safety hazard may occur if liquid helium encounters air. Air solidifies in contact with liquid helium, and precautions must be taken when transferring liquid helium from one vessel to another or when venting. Over pressurization and rupture of the container may result. All liquid helium containers must be equipped with a pressure-relief device. The latent heat of vaporization of liquid helium is extremely low (20.5J/gm). Therefore, heat leaks can cause rapid pressure rises.

The boiling point of liquid nitrogen is below that of liquid oxygen, it is possible for oxygen to condense on any surface cooled by liquid nitrogen. If the system is subsequently closed and the liquid nitrogen removed, the evaporation of the condensed oxygen may over-pressurize the equipment or cause a chemical explosion if exposed to combustible materials like oil.

Safe handling considerations when working with cryogenic gases and liquids:
- Wear appropriate protective clothing including face shield and goggles, non-absorbent insulated gloves, non-woven fabric apron and clothing free of pockets or turned-up edges.
- Do not wear open-toed shoes, sandals, or other footwear that would allow liquid nitrogen to come in contact with your feet. Refrain from wearing sweaters, mufflers, scarves, or bulky socks worn outside of boot tops.
- Always handle cryogenic liquids in well-ventilated areas to prevent possible gas or vapor accumulation that may produce an oxygen-deficient atmosphere and lead to asphyxiation.
- Remain at the fill station until the liquid transfer is complete.
- Know the properties, hazards and procedures associated with cryogenic liquids, refer to manufacturers Material Safety Data Sheets (MSDS) for proper handling and use.
- Stand clear of cold gases and liquids that are boiling or splashing.
- Use only containers specifically designed for holding cryogenic liquids.
- Store small, empty containers indoors or in areas free from rain or excessive moisture.
- Fill containers slowly to minimize thermal shock to the container.
- Cover dewars when the liquid is not being transferred to prevent build up of oxygen and subsequent explosion.
- When transferring cryogenic fluids from open containers, pour below your chest level.
- Consider transportation and handling procedures so that you do not endanger yourself or other people in the area.
DEMARcation

Demarcation, the setting or making of definable boundaries to insure ones safety, is intended to help the safety process, housekeeping, by ensuring there is a place for everything, and everything is in its place, all the time. Here are some practical guidelines concerning demarcation:

- Always observe the demarcation lines, barriers, and handrails.
- Do not stack or store articles in "No Stacking," areas.
- Keep areas below switchgear, eyewash stations and fire extinguishers clear.
- Only park vehicles in a demarcated parking area.
- Some demarcations may call for special personal protective equipment, observe them.
- Do not stack materials and goods in a non-demarcated area.
- If you observe trespassing of demarcation, report it.
- Remember that demarcation helps create order and order makes the work areas safe.

ELECTRICAL SAFETY

Unsafe electrical conditions have high potential for injury and even death due to electrical shock. Unsafe behaviors can have the same consequences. The most important rule concerning electrical safety is not to interfere with or work on any electrical installation if you are not authorized or qualified.

Follow the basic electrical safety rules and report any unsafe electrical wiring or situations.

Protect Yourself from Electrical Hazards:

- Only qualified employees are authorized to perform electrical jobs.
- Have respect for portable electrical equipment. 110 volts can electrocute.
- Obey all warning signs.
- Do not use any equipment that has defective parts or loose electrical connections. Report to a supervisor when there is defective equipment detected.
- Use a portable ground fault interrupter when required, e.g., in damp areas, in confined spaces, or in the vicinity of grounded structures.
- Use double insulated electrical tools if possible.
- Never use adapter plugs.
- Do not let temporary wiring become permanent.
- Do not attempt to operate any switch or other energy-isolating device bearing a lock and/or warning tag.
- Do not handle electrical equipment while standing on a wet surface.
- Metal ladders shall never be used around electrical circuits or in places where they might come in contact with electricity.
- All power machines must have electrical control switches in such a location as to make it possible for the operator to cut off the power without leaving his or her position or reaching across the point of operation.
- Never alter or try to force a plug into an outlet.
• Electrical equipment must be accessible for maintenance and emergency purposes at all times. Do not block the access to this equipment. A minimum space 30 inches wide by 36 inches deep must be maintained directly in front of the equipment.

• Report all cases of electrical shock, however minor, to your supervisor. The equipment then needs to be temporarily tagged "DO NOT START", indicating problem and name of person in charge. If there will be a delay in repair of the equipment, the switch in the system must be locked out.

• Do not use defective electrical equipment. Check frequently for defective wiring, frayed cords, plugs and switches, and cracked or loose outlets, or loose plugs in outlets. Mark defective equipment by attaching a warning tag to prevent its use until it can be repaired.

• All electric extension cords to portable power tools must be standard heavy-duty three-wire cords with grounding type plugs.

• If a two-prong adapter plug is used in a two-cavity receptacle, the ground pigtail must be connected to the outlet screw.

• Hot plates, coffee pots, and other special heating equipment must be properly grounded.

• Do not roll wheeled equipment over electrical cords.

• Do not run cords under carpet or mats, or across areas where there is a possibility they may be stepped on or tripped over.

• Use only approved power tools in explosive atmospheres.

• Read and understand the company Lockout Tag out safety procedures.

Additional Precautions for the Electricians:

• Read and understand the company Lockout Tag out safety procedures.

• If you work with electricity always wear the protective equipment prescribed.

• Always lock out, tag out, and try out when working with or around electrical apparatus.

• All electrical equipment should bear the label of a nationally recognized testing laboratory such as Underwriter's Laboratories (UL) or Factory Mutual Engineering Corporation (FM).

• Purchase of new equipment must specify three-wire powered or double insulation.

• The only multiple outlet adapters allowed are those that have fuses and internal circuit breakers. Rearranging equipment or installing additional outlets is always preferred over these devices.

• All existing electrical equipment must be modified to three-wire power cords with a grounding type plug or have a designation of double insulation.

• All electric equipment and circuits must be clearly identified. Equipment must be identified with the manufacturer's tag including the voltage and current, and any other identification as may be required; circuits must be appropriately identified as to what they control.

ELECTRICAL CHECKLIST

☐ Do you specify compliance with OSHA for all contract electrical work?

☐ Are all employees required to report, as soon as practicable, any obvious hazard to life or property observed in connection with electrical equipment or lines?

☐ Are employees instructed to make preliminary inspections and/or appropriate tests to determine what conditions exist before starting work on electrical equipment or lines?
When electrical equipment or lines are to be serviced, maintained or adjusted are necessary switches opened, locked out, and tagged whenever possible?

Are portable electrical tools and equipment grounded or of the double insulated type?

Are electrical appliances such as vacuum cleaners, polishers and vending machines grounded?

Do extension cords being used have a grounding conductor?

Are multiple plug adapters prohibited?

Are ground fault circuit interrupters installed on each temporary 15 or 20-ampere, 120 volt AC circuit at locations where construction, demolition, modifications, alterations or excavations are being performed?

Do suitable disconnecting switches or plug connectors at the junction with permanent wiring protect all temporary circuits?

Do you have electrical installations in hazardous dust or vapor areas? Is so; do they need the National Electrical Code (NEC) for hazardous locations?

Is exposed wiring and cords with frayed or deteriorated insulation repaired or replaced promptly?

Are flexible cords and cables free of splices or taps?

Are clamps or other securing means provided on flexible cords or cables at plugs, receptacles, tools, equipment, etc. and is the cord jacket securely held in place?

Are all cord, cable and raceway connections intact and secure?

In wet or damp locations, are electrical tools and equipment appropriate for the use or location or otherwise protected?

Is the location of electrical power lines and cables (overhead, underground, under floor, other side of walls) determined before digging, drilling or similar work is begun?

Are metal measuring tapes, ropes, hand lines or similar devices with metallic thread woven into the fabric prohibited where they could come in contact with energized parts of equipment or circuit conductors?

Is the use of metal ladders prohibited in areas where the ladder or the person using the ladder could come in contact with energized parts of equipment, fixtures or circuit conductors?

Are all disconnecting switches and circuit breakers labeled to indicate their use or equipment served?

Are disconnecting means always opened before fuses are replaced?

Do all interior wiring systems include provisions for grounding metal parts of electrical raceways, equipment and enclosures?

Are all electrical raceways and enclosures securely fastened in place?

Are all energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures?

Is sufficient access and working space provided and maintained about all electrical equipment to permit ready and safe operations and maintenance?
Are all unused openings (including conduit knockouts) in electrical enclosures and fittings closed with appropriate covers, plugs or plates?

Are electrical enclosures such as switches, receptacles and junction boxes provided with tight fitting covers or plates?

Are disconnecting switches for electrical motors in excess of two horsepower, capable of opening the circuit when the motor is in a stalled condition, without exploding? (Switches must be horsepower rated equal to or in excess of the motor hp rating.)

Is low voltage protection provided in the control device of motors driving machines or equipment that could cause probable injury from inadvertent starting?

Is each motor disconnecting switch or circuit breaker located within sight of the motor control device?

Is each motor located within sight of its controller or the controller disconnecting means capable of being locked in the open position or is a separate disconnecting means installed in the circuit within sight of the motor?

If the controller for each motor is in excess of two horsepower, is it rated in horsepower equal to or in excess of the rating of the motor it serves?

Are employees who regularly work on or around energized electrical equipment or lines instructed in the cardiopulmonary resuscitation (CPR) methods?

Are employees prohibited from working alone on energized lines or equipment over 600 volts?

ELEVATED SURFACES CHECKLIST

Are signs posted, when appropriate, showing the elevated surface load capacity?

Are surfaces elevated more than 30 inches (76.20 centimeters) above the floor or ground provided with standard guardrails?

Are all elevated surfaces (beneath which people or machinery could be exposed to falling objects) provided with standard 4-inch (10.16 centimeters) toe boards?

Are permanent means of access and egress provided to elevated storage and work surfaces?

Is required headroom provided where necessary?

Is material on elevated surfaces piled, stacked or racked in a manner to prevent it from tipping, falling, collapsing, rolling or spreading?

Are dock boards or bridge plates used when transferring materials between docks and trucks or rail cars?

EMERGENCY FIRST AID AND MEDICAL SERVICES

Knowledge of emergency first aid could help you save a life and render valuable assistance to an injured employee. Learn and know by heart the steps for severe bleeding, electric shock, choking and CPR.

Know where first aid kits, emergency equipment and emergency procedures are located in your work area.
If you are the first on the scene of an accident, fast action is important. Check that the site is safe before doing anything else. Phone the emergency number and summons help immediately. Do not leave the victim unattended unless there is no one else to go for help. Render first aid. If you must leave the victim, make sure he is in a safe position.

**Control of Bleeding**

Act quickly.
Send for medical assistance immediately.
Apply direct pressure to the wound.
Elevate the injured portion of the body and make the person comfortable.

EXTREME CAUTION SHOULD BE EXERCISED WHEN CONTACTING BODY FLUIDS, WEAR MEDICAL GLOVES WHENEVER POSSIBLE.

**Electrical Shock**

Electrical shock can render the victim unconscious and stop their breathing. Release the victim from any electrical contact, remember every second is precious. Delay may be fatal. Isolate the source of current and use a non-conductive piece of dry timber to move the victim from the contact with the current.

**The Heimlich Maneuver for Choking**

ASK: “Are you choking?” if the victim can’t breathe or speak…

Begin the Heimlich Maneuver:
- Stand behind the victim.
- Wrap your arms around the victim’s waist and grab the fist of one hand with your other hand.
- Place the thumb side of your fist against the victim’s stomach, slightly above the navel and below the rib cage.
- Press your fist into the victim’s stomach and give up to 5 abdominal thrusts.
- Repeat series of thrusts until effective or victim becomes unconscious.
- [Not recommended for infants under 1 year old]
- THE A-B-C’s OF C.P.R.

**DETERMINE RESPONSIVENESS**

If victim appears unconscious, gently shake a shoulder and shout: “Are you OK?”
If no response, have someone call the emergency number.
If alone, call for emergency back up before commencing ABC’s.

**A is for AIRWAY**

Roll victim onto back as a unit, supporting head and neck.
Open airway by head tilt/chin-lift maneuver.
Look, listen and feel for breathing for 3-5 seconds.
If no response, proceed to B.
B is for BREATHING

Pinch victim’s nose shut.
If possible, place a CPR barrier over the victim’s mouth (you can find these in the First Aid kits)
Put your mouth over victims, making a tight seal.
Give two slow breaths.
If breathing does not go through [Chest does not rise], reposition and try again. If breaths still do not go through, refer to Heimlich Maneuver.
If breaths go through, proceed to C.

C is for CIRCULATION

Check carotid pulse for 5 to 10 seconds.
If there is a pulse but no breathing, give 1 breath every 5 seconds [About 12 breaths per minute] until victim is breathing or help arrives.
If no pulse, begin chest compression.

BEGIN CARDIOPULMONARY RESUSCITATION [CPR] ONLY IF YOU ARE TRAINED

Perform 15 external chest compressions at the rate of 80 to 100 per minute.
Reopen airway and give two (2) full breaths.
After 4 cycles of 15:2 [About one minute], check pulse.
If no pulse, continue 15:2 cycle beginning with chest compression until advanced life support is available.

EMPLOYER POSTING CHECKLIST

- Is the required OSHA workplace poster displayed in a prominent location where all employees are likely to see it?
- Are emergency telephone numbers posted where they can be readily found in case of emergency?
- Where employees may be exposed to any toxic substances or harmful physical agents, has appropriate information concerning employee access to medical and exposure records and “Material Safety Data Sheets” been posted or otherwise made readily available to affected employees?
- Are signs concerning “Exiting from buildings,” room capacities, floor loading, biohazards, exposures to x-ray, microwave, or other harmful radiation or substances poster where appropriate?
- Is the Summary of Occupational Illnesses and Injuries (OSHA Form 300) posted in the month of February?

ENVIRONMENTAL CONTROLS CHECKLIST

- Is all work areas properly illuminated?
- Are employees instructed in proper first aid and other emergency procedures?
- Are hazardous substances, which may cause harm by inhalation, ingestion, or skin absorption or contact?
- Are employees aware of the hazard involved with the various chemicals they may be exposed to in their work environment, such as ammonia, chlorine, epoxies, caustics, etc.?
- Is employee exposure to chemicals in the work place kept within acceptable levels?
- Can a less harmful method or process be used?
- Is the work area’s ventilation system appropriate for the work being performed?
- Is spray-painting operations done in spray rooms or booths equipped with an appropriate exhaust system?
- Is employee exposure to welding fumes controlled by ventilation, use of respirators, exposure time or other means?
- Are welders and other workers nearby provided with flash shields during welding operations?
- If forklifts and other vehicles are used in buildings or other enclosed areas, are the carbon monoxide levels kept below maximum acceptable concentration?
- Has there been a determination that noise levels in the facilities are within acceptable levels?
- Are steps being taken to use engineering controls to reduce excessive noise levels?
- Are proper precautions being taken when handling asbestos and other fibrous materials?
- Are caution labels and signs used to warn of hazardous substances (e.g., asbestos) and biohazards (e.g., bloodborne pathogens)?
- Are wet methods used, when practicable, to prevent the emission of airborne asbestos fibers, silica dust and similar hazardous materials?
- Are engineering controls examined and maintained or replaced on a scheduled basis?
- Is vacuuming with appropriate equipment used whenever possible rather than blowing or sweeping dust?
- Are grinders, saws, and other machines that produce inhaleable dusts vented to an industrial collector or central exhaust system?
- Are all local exhaust ventilation systems designed and operating properly such as airflow and volume necessary for the application, ducts not plugged or belts slipping?
- Is personal protective equipment provided, used and maintained wherever required?
- Are there written standard operating procedures for the selection and use of respirators where needed?
- Are restrooms and washrooms kept clean and sanitary?
- Is all water provided for drinking, washing and cooking potable?
- Are all outlets for water not suitable for drinking clearly identified?
- Are employees’ physical capacities assessed before being assigned to jobs requiring heavy work?
- Are employees instructed in the proper manner of lifting heavy objects?
- Where heat is a problem, have all fixed work areas been provided with spot cooling or air conditioning?
- Are employees screened before assignment to areas of high heat to determine if their health condition might make them more susceptible to having an adverse reaction?
- Are employees working on streets and roadways where they are exposed to the hazards of traffic, required to wear bright colored (traffic orange) warning vests?
Are exhaust stacks and air intakes so located that contaminated air will not be re-circulated within a building or other enclosed area?

Is equipment producing ultraviolet radiation properly shielded?

Are universal precautions observed where occupational exposure to blood or other potentially infectious materials can occur and in all instances where differentiation of types of body fluids or potentially infectious materials are difficult or impossible?

EXIT DOORS CHECKLIST

Are doors that are required to serve as exits designed and constructed so that the way of exit travel is obvious and direct?

Are windows that could be mistaken for exit doors, made inaccessible by means of barriers or railings?

Are exit doors operable from the direction of exit travel without the use of a key or any special knowledge or effort when the building is occupied?

Is a revolving, sliding or overhead door prohibited from serving as a required exit door?

Where panic hardware is installed on a required exit door, will it allow the door to open by applying a force of 15 pounds (6.75 kilograms) or less in the direction of the exit traffic?

Are doors on cold storage rooms provided with an inside release mechanism, which will release the latch and open the door even if it is padlocked or otherwise locked on the outside?

Where exit doors open directly onto any street, alley or other area where vehicles may be operated, are adequate barriers and warnings provided to prevent employees from stepping into the path of traffic?

Are doors that swing in both directions and are located between rooms where there is frequent traffic, provided with viewing panels in each door?

EXITING OR EGRESS CHECKLIST

Are all exits marked with an exit sign and illuminated by a reliable light source?

Are the directions to exits, when not immediately apparent, marked with visible signs?

Are door, passageways or stairways, that are neither exits nor access to exits, and which could be mistaken for exits, appropriately marked “NOT AN EXIT,” “TO BASEMENT,” “STOREROOM,” etc.?

Are exit signs provided with the word “EXIT” in lettering at least 5 inches (12.7 centimeters) high and the stroke of the lettering at least ½-inch (1.27 centimeters) wide?

Are exit doors side-hinged?

Are all exits kept free of obstructions?

Are at least two means of egress provided from elevated platforms, pits or rooms where the absence of a second exit would increase the risk of injury from hot, poisonous, corrosive, suffocating, flammable, or explosive substances?
Are there sufficient exits to permit prompt escape in case of emergency?

Are special precautions taken to protect employees during construction and repair operations?

Are the number of exits from each floor of a building and the number of exits from the building itself, appropriate for the building occupancy load?

Are exit stairways that are required to be separated from other parts of a building enclosed by at least 2-hour fire-resistant construction in buildings more than four stories in height, and not less than 1-hour fire-resistant constructive elsewhere?

Where ramps are used as part of required exiting from a building, is the ramp slope limited to 1 foot (0.3048 meters) vertical and 12 feet (3.66 meters) horizontal?

Where exiting will be through frameless glass doors, glass exit doors, or storm doors are the doors fully tempered and meet the safety requirements for human impact?

**EYE AND FACE PROTECTION**

This section establishes controls for the safe and effective use of eye and face protection for potentially hazardous occupations and tasks and to ensure that safety glasses, goggles and shields are matched to the task. Protective eye and face devices shall comply with ANSI Z87.1 – 1989.

Safety glasses, goggles and shields are designed to reduce physical contact risks and/or prevent direct chemical contact. However, safety glasses, shields and goggles cannot provide complete protection from these hazards. Selected processes and/or conditions can exceed the safety glasses, shields or goggles capacity to protect against serious injury. Safety glasses, shields and goggles shall be inspected before each use, do not use if damaged.

Your eyes and face can be exposed to hazards such as flying objects (from hand tools or other equipment), small particles (grinding wheels), dusts, splashes of corrosive liquids and metals, injurious light or heat rays, and hazardous gas fumes. Approved eye and face protection equipment shall be used in areas/operations/tasks where an eye and face injury hazard potential exists. The following are examples:

- **Mechanical Hazards** include abrasion, flying objects, compressed air, airborne particles, and others. Eyewear shall be designed to reduce the risk of injury through direct physical contact. Protective eyewear includes safety glasses with side shields, goggles and face shields.

- **Physical Hazards** include heat, radiation, and molten metal hazards. Protective eyewear includes welding face shields, welding goggles, brazing goggles, laser goggles and others.

- **Chemical Hazards** include chemical splash, spraying of chemicals, cryogenics and irritant gas hazards. Protective eyewear includes chemical splash goggles, face shields, and dust/gas goggles.

- **Biological Hazards** include blood borne pathogen splash hazards.

- **Multiple Hazards** (mechanical and/or physical and/or chemical and/or biological) may require specialized equipment or a combination of the above.

Employees are required to wear safety glasses at all times when working in a posted "safety glasses required area" due to the hazards that the area may pose. If the entire area does not require safety glasses, then the individual operations or equipment should be posted, not the entire area. Any exceptions to posted sign requirements are to be
documented in the department procedures. If no department procedure exists, it is assumed that all persons entering a posted area or room shall be in compliance.

Eye and face protection equipment must be worn and maintained in a clean and usable condition. It shall be stored in such a manner that will ensure no contamination of the equipment, either from improper sharing by employees, or from the work place. Proper storage must be provided for chemical goggles and face shields.

**Specialty Lenses**

Glasses with tinted (filter or absorptive) lenses are required when employees are exposed to glare and harmful radiation. Employees who work with laser equipment may require eye protection. Laser goggles or spectacles must be matched to the specific wavelength of the laser radiation and then worn.

**Contact Lenses**

Contact lens wearers need to wear eye protection in addition to their contact lenses if their task requires eye protection. There may be instances that can produce dust, gas or vapors that could be harmful to employees wearing contact lenses. It is therefore preferred that you wear corrective safety glasses if your tasks exposes you to these types of hazards. Restrictions on contact lens wear do not apply to usual office or secretarial employees.

**Photochromatic Lenses**

OSHA standard 29 CFR 1910.133(a)(6) prohibits the use of photochromatic lenses for safety glasses at inside work locations which have variable lighting conditions, because the variable tint lenses would cause temporary vision impairment when the light changes from bright to dim or vice verse in the work area. However, they are allowed inside when the lighting conditions do not change substantially and the employees constantly stay in the area, particularly if glare or bright lights are a problem. They may also be used by employees working outdoors, provided there is no ultraviolet or infrared hazard.” As of this publication, OSHA has not commented on the new technology “Transitions” type lenses. NOAO/NSO does allow Transition type lenses in safety glasses for employees that work outdoors.

**Non Prescription Safety Eyewear**

Protective eyewear selected for use shall comply with ANSI Z87.1 -1989. Supervisors and manager shall provide non-prescription safety eyewear for their employees and visitors. The risk management office will provide safety glasses by request.

**Prescription Safety Eyewear**

Prescription eyewear lenses and frames shall be made of polymer, and shall meet or exceed the specifications outlined in ANSI Z87.1 1989.

Prescription safety eyewear will be furnished, through AURA, Inc.-NOAO/NSO's vendor at no cost to the employee every other calendar year upon proper request. Employees are responsible to obtain the Physicians prescription.

Managers or supervisors are responsible for submitting written requests for their employees, by e-mail for the purchase, repair/replacement of prescription safety glasses to the risk management department. The risk management department will authorize the request and prepare the necessary paperwork for the employee.
Safety glasses, frames and/or lenses that are damaged, broken, or require adjustment will be repaired, replaced and adjusted at no cost to the employee. Replacement lenses will be authorized following a prescription change.

**FALL PROTECTION**

Falls at work and at home have dire consequences and result in severe and often permanent injuries. Fall protection is required in certain situations where there is a possibility of a person falling from a height. Some of these situations are as follows.

**Fall Protection is Required:**
- When working at a height of 4 feet or more and you are not on a work platform.
- When working from a scaffold higher than 4 feet high.
- When operating and riding in a man lift.
- Where there is a chance you may fall.
- When working on, or near the edge of platforms.
- Around openings.
- When on a platform designed to lift a person to any height over 4 feet.
- Where possible, the fall hazard should be covered or guarded, if not, fall protection is required.

There may be other situations in your work area that require you to wear fall protection, when in doubt, check with your supervisor or manager.

**FIRE PREVENTION AND PROTECTION**

The best way to fight fires is to prevent them. The following are rules related to fire prevention and protection:
- Keep work areas free from excessive material.
- Keep motors and tools free from dust and grease.
- Do not let transmission shafts or bearings overheat.
- Dispose of combustible scrap, such as oily rags, in metal containers with tight fitting lids. These containers are specially marked.
- Welding and cutting operations must only be carried out in designated areas.
- If necessary obtain a hot work or burning permit.
- Screen the welding area to protect others and reduce the chance of sparks flying.
- Never use oil or grease on oxygen bottles, hoses or fittings.
- Take fire drills and evacuation drills seriously, they are exercises for your safety.
- Learn the location of fire exits in your area.
- Get trained in the use of fire extinguishers. Know the members of the fire \ rescue team in your area.
- Do not stack or store anything below or near fire fighting equipment.
- Do not use the fire hoses and extinguishers for any other purpose than fire fighting.
- Obey the “No Smoking” signs.
- Smoke only in areas that have at least a six feet diameter area that is barren of all flammable and combustible materials and extinguish smoking materials in closed ash containers.
• Do not drop lit cigarettes into trash cans.
• Do not throw cigarettes out of vehicles. All company vehicles on site are “No Smoking” zones.
• Open fires, campfires, charcoal burning devices, fireworks are not permitted unless approved by senior
  management and/or the department having jurisdiction. Petroleum and LP fueled stoves, lanterns, or
  heating devices are exempt from this restriction.
• If a fire extinguisher has been discharged or is in poor condition, it must be replaced immediately. Report it.
• Crosscheck that the fire equipment in your area has been inspected for the month.
• Report any fire hazard or defective fire equipment immediately.
• Storage of flammable liquids in refrigerators is not allowed unless the refrigerator is specially designed,
  wired and labeled as being safe for flammable liquid storage.
• Flammable storage near refrigerators is allowed only if the refrigerator is explosion proof.

FIRE PROTECTION CHECKLIST

☐ Is your local fire department well acquainted with your facilities, its location and specific hazards?

☐ If you have a fire alarm system, is it certified as required? The basement of the main building is protected by
  sprinkler systems, computer room with Halon, and there are “pull stations” in the main building for fire alarms. All
  these systems are inspected per NFPA guidelines.

☐ If you have a fire alarm system, is it tested at least annually?

☐ If you have interior standpipes and valves, are they inspected regularly?

☐ If you have outside private fire hydrants, are they flushed at least once a year and on a routine preventive
  maintenance schedule?

☐ Are fire doors and shutters in good operating condition?

☐ Are fire doors and shutters unobstructed and protected against obstructions, including their counterweights?

☐ Are fire door and shutter fusible links in place?

☐ Are automatic sprinkler system water control valves, air and water pressure checked weekly/periodically as
  required?

☐ Is the maintenance of automatic sprinkler systems assigned to responsible persons or to a sprinkler contractor?

☐ Do metal guards protect sprinkler heads, when exposed to physical damage?

☐ Is proper clearance maintained below sprinkler heads?

☐ Are portable fire extinguishers provided in adequate number and type?

☐ Are fire extinguishers mounted in readily accessible locations?

☐ Are fire extinguishers recharged regularly and noted on the inspection tag?

☐ Are employees periodically instructed in the use of extinguishers and fire protection procedures?
FIRE EXTINGUISHER: HOW TO OPERATE

Portable fire extinguishers are classified to indicate their ability to handle specific classes and sizes of fires. Locate the types of fire extinguishers that are in your work areas, usually by doorways. Labels on fire extinguishers indicated the class and relative size of fire that they can handle. Generally facilities personnel are the persons designated to use fire fighting equipment. Most employees are instructed to assess the situation for their own personal safety to evacuate the area and notify the fire department by dialing 911.

**STEP 1**
Locate and remove fire extinguisher from bracket.

**STEP 2**
Check that it has not been discharged. A red button or the gauge shows if it has been discharged.

**STEP 3**
Hold the handle in your left hand and remove the safety pin.

**STEP 4**
Remove the flexible hose and hold in your right hand. (Ansle type extinguishers require you push the silver push button on the top of the extinguisher to activate)

**STEP 5**
Aim the nozzle at the base of the fire and squeeze the handle. Distribute the white powder or gas being discharged at the base of the fire with a sweeping motion.

FIRST AID CHECKLIST AND MEDICAL SERVICES

- Is there a hospital, clinic, or infirmary for medical care in proximity of your workplace?
- If medical and first aid facilities are not in proximity of your workplace, is at least one employee (preferably two) on each shift currently qualified to render first aid?
- Have all employees who are expected to respond to medical emergencies as part of their work*:
  1. Received first-aid training.
  2. Received hepatitis B vaccination.
  3. Trained appropriately on procedures to protect them from blood-borne pathogens; including universal precautions.
- Have available and understand how to use appropriate personal protective equipment to protect against exposure to blood-borne diseases.

*Pursuant to an OSHA memorandum of July 1, 1992, employees who render first-aid only as a collateral duty do not have to be offered pre-exposure hepatitis B vaccine only if the employer puts the following requirements into his/her exposure control plan and implements them: 1) the employer must record all first-aid incidents involving the presence of blood or other potentially infectious materials before the end of the work shift during which the first-aid incident occurred; 2) the employer must comply with post-exposure evaluation, prophylaxis, and follow-up requirements of the standard with respect to “exposure incidents,” as defined by the standard; 3) the employer must train designated first-aid providers about the reporting procedure; and 4) the employer must offer to initiate the hepatitis B vaccination series within 24 hours to all unvaccinated first-aid providers who have rendered assistance in any situation involving the presence of blood or other potentially infectious materials.
Where employees have had an exposure incident involving blood-borne pathogens, did you provide an immediate post-exposure medical evaluation and follow-up?

Are medical personnel readily available for advice and consultation on matters of employees' health?

Are emergency phone numbers posted?

Are first aid kits easily accessible to each work area, with necessary supplies available, periodically inspected and replenished as needed?

Has a physician, indicating that they are adequate for a particular area or operation approved first-aid kit supplies?

Are means provided for quick drenching or flushing of the eyes and body in areas where corrosive liquids or materials are handled?

**FIRST AID SUPPLIES**

In accordance with OSHA §1910.151(b) and American National Standard (ANSI) Z308.1-1978 medical supplies are supplied in work areas.

Under this standard, the following are the minimum acceptable contents of first-aid kits:

- Absorbent compress
- Adhesive bandages
- Adhesive tape
- Antiseptic applications
- Burn treatment applications
- Sterile pads
- Medical exam gloves
- Triangular bandage

The standard gives specific dimensions, details, number of units, etc., of the minimum acceptable contents listed above.

The standard also requires the kit to be marked with the ANSI designation and it recommends regular inspection of first aid kit contents and that one worker in each work location be trained.

ANSI standards become mandatory OSHA standards only when, and if, OSHA adopts them; ANSI Z308.1, Minimum Requirements for Workplace First Aid Kits, was not adopted by OSHA. However, ANSI Z308.1 provides detailed information regarding the requirements for first aid kits; OSHA has often referred employers to ANSI Z308.1 as a source of guidance for the minimum requirements for first aid kits. We at NOAO/NSO/NSO provide for the standard in all areas plus oversee that kits are updated and restocked regularly.
**FIXED LADDERS**

Fixed ladders shall be designed and inspected for the following:

- The minimum live load design shall be at least 200 lbs. exerted to provide maximum stress.
- Metal rungs shall be a minimum of 1-inch diameter by 16 inches long. The distance between rungs shall not exceed 12 inches.
- Rungs, cleats and steps shall be free of splinters, sharp edges, burrs, or other projections. All ladders shall be inspected regularly.
- The clearance on the climbing side shall range from a minimum of 36 inches on a 76° ladder slope to 30 inches on a 90° ladder slope.
- A clearway at least 15 inches on each side of the centerline of a ladder shall be maintained except where cages or wells are necessary.
- The clearance from the rung to the nearest object back of a-fixed ladder shall be at least 7 inches.
- All fixed ladders between 20 feet and 30 feet in unbroken lengths shall have cages that extend to between 7 and 8 feet from the ladder base, or a fixed rail climbing system.
- The preferred pitch of fixed ladders shall be within 75°- 90° from the horizontal.

**FLAMMABLE AND COMBUSTIBLE MATERIALS CHECKLIST**

- Are combustible scrap, debris and waste materials (oily rags, etc.) stored in covered metal receptacles and removed from the work site promptly?
- Is proper storage practiced to minimize the risk of fire including spontaneous combustion?
- Are approved containers and tanks used for the storage and handling of flammable and combustible liquids?
- Are all connections on drums and combustible liquid piping, vapor and liquid tight?
- Are all flammable liquids kept in closed containers when not in use (e.g., parts cleaning tanks, pans, etc.)?
- Are bulk drums of flammable liquids grounded and bonded to containers during dispensing?
- Do storage rooms for flammable and combustible liquids have explosion proof lights?
- Do storage rooms for flammable and combustible liquids have mechanical or gravity ventilation?
- Is liquefied petroleum gas stored, handled and used in accordance with safe practices and standards?
- Are “NO SMOKING” signs posted on liquefied petroleum gas tanks?
- Are liquefied petroleum storage tanks guarded to prevent damage from vehicles?
- Are all solvent wastes and flammable liquids kept in fire resistant, covered containers until they are removed from the work site?
- Is vacuuming used whenever possible rather than blowing or sweeping combustible dust?
- Are firm separators placed between containers of combustibles or flammables, when stacked one upon another, to assure their support and stability?
- Are fuel gas cylinders and oxygen cylinders separated by distance and fire resistant barriers while in storage?
- Are fire extinguishers selected and provided for the types of materials in areas where they are to be used?
  
  Class A Ordinary combustible materials fire.
  
  Class B Flammable liquid, gas or grease fires.
  
  Class C Energized electrical equipment fires.
- Are appropriate fire extinguishers mounted within 75 feet (22.86 meters) of outside areas containing flammable liquids and within 10 feet (3.05 meters) of any inside storage area for such materials?
- Are extinguishers free from obstructions or blockage?
- Are all extinguishers serviced, maintained and tagged at intervals not to exceed one year?
- Are all extinguishers fully charged and in their designed places?
- Where sprinkler systems are permanently installed, are the nozzle heads so directed or arranged that water will not be sprayed into operating electrical switchboards and equipment?
- Are “NO SMOKING” signs posted where appropriate in areas where flammable or combustible materials are used or stored?
- Are safety cans used for dispensing flammable or combustible liquids at a point of use?
- Are all spills of flammable or combustible liquids cleaned up promptly?
- Are storage tanks adequately vented to prevent the development of excessive vacuum or pressure because of filling, emptying or atmosphere temperature changes?
- Are storage tanks equipped with emergency venting that will relieve excessive internal pressure caused by fire exposure?
- Are “NO SMOKING” rules enforced in areas involving storage and use of hazardous materials?

**FLOOR AND WALL OPENINGS CHECKLIST**

- Are floor openings guarded by a cover, a guardrail, or equivalent on all sides (except at entrance to stairways or ladders)?
- Are toe boards installed around the edges of permanent floor opening (where persons may pass below the opening)?
- Are skylight screens of such construction and mounting that they will withstand a load of at least 200 pounds (90 kilograms)?
- Is the glass in the windows, doors, glass walls, etc., which are subject to human impact, of sufficient thickness and type for the condition of use?
- Are grates or similar type covers over floor openings such as floor drains of such design that foot traffic or rolling equipment will not be affected by the grate spacing?
Are unused portions of service pits and pits not actually in use either covered or protected by guardrails or equivalent?

Are manhole covers, trench covers and similar covers, plus their supports designed to carry a truck rear axle load of at least 20,000 pounds (9000 kilograms) when located in roadways and subject to vehicle traffic?

Are floor or wall openings in fire resistive construction provided with doors or covers compatible with the fire rating of the structure and provided with a self-closing feature when appropriate?

Are stairway handrails located between 30 (76.20 centimeters) and 34 inches (86.36 centimeters) above the leading edge of stair treads?

Do stairway handrails have at least 3 inches (7.62 centimeters) of clearance between the handrails and the wall or surface they are mounted on?

Where doors or gates open directly on a stairway, is there a platform provided so the swing of the door does not reduce the width of the platform to less than 21 inches (53.34 centimeters)?

Are stairway handrails capable of withstanding a load of 200 pounds (90 kilograms) applied within 2 inches (5.08 centimeters) of the top edge, in any downward or outward direction?

Where stairs or stairways exit directly into any area where vehicles may be operated, are adequate barriers and warnings provided to prevent employees stepping into the path of traffic?

Do stairway landings have a dimension measured in the direction of travel, at least equal to the width of the stairway?

Is the vertical distance between stairway landings limited to 12 feet (3.66 meters) or less?

FOOD SAFETY

This section shall be viewed as minimum guidelines for food processing operations. With good personal hygiene and sanitation procedures, the likelihood of food-borne illness can be greatly reduced. Additional information regarding the safe handling of food can be obtained from the Arizona Food Code 2000.

Employees in food services can also be exposed to sharp hand tools, specialized machinery, and the handling of hot materials. Kitchen safety can be achieved after clear, concise instructions have been given to personnel. It is the responsibility of the supervisor to ensure that safety training is provided to the food services employees.

Hygiene and Sanitation

The primary conditions responsible for food-borne illness stem mainly from three sources:

- Employees
- Temperature and time control
- Cross contamination
Employees Play an Important Role

Employees can contribute inadvertently to the spread of food-borne illnesses in two basic ways: through their own illnesses and by not following good hygiene practices. Employees should not be allowed to prepare food, or work with sanitized equipment, utensils or other service items intended for use by the food consumer if, when reporting to work, they:

- are ill
- have a persistent cough, sneeze, or runny nose with discharge
- have symptoms of intestinal illness
- have an open cut or wound.

At the start of each shift, employees whose duties require the handling and preparation of food should be screened to assure that none of the conditions listed above is present. It is incumbent upon supervisors and management to assure that employees who have any of these conditions are removed from food preparation areas and assigned to alternate duties, where possible. Any employee reassigned because of the presence of any of these conditions should be required to obtain documentation from a medical physician attesting to the employee's health and suitability to return to work in food handling and preparation task.

Good Personal Hygiene is Essential

Basic hygiene practices include all aspects of personal cleanliness, from the time the employee arrives to begin work to the time they leave at the end of the assigned work period. Cleanliness pertains to hands, including fingernails, arms, jewelry, and all outer clothing. In simple terms, employees must keep their hands and arms clean.

Hand and arm washing should take place:

- at the beginning of the work period
- after using the toilet
- after eating, drinking, coughing, sneezing, or using tobacco
- after working with un-sanitized equipment or utensils
- whenever switching task or food groups.

Washing should take place at a lavatory that is designated for personal cleanliness, where washing of food, equipment, or utensils is forbidden. A special hand washing solution and fingernail brush should be provided and its use must be required.

Wearing of jewelry (with the exception of a plain wedding band) should be forbidden for two reasons. First, jewelry could fall into the food and become a foreign object, with the potential to cause injury to consumers. Second, food particles could become lodged in or on the jewelry, leading to contamination of the food product being prepared (or of other food products prepared later).

In addition to clean hands and arms, clean clothing is important. Clothing serves as a barrier to the spread of food-borne illness and contamination of food. If an employee's outer clothing becomes soiled during the food preparation task, the employee should exchange it for clean clothing before he or she moves on to the next assignment. Likewise, clothing worn during non-food preparation task should be changed before beginning any activities related to
food preparation. In addition to aprons, lab coats, and smocks, hair and hand coverings offer added protection. Hair coverings include not only hairnets or caps, but also beard coverings or nets. If gloves are required, they should be single-use gloves and should be changed whenever the food preparation task changes.

**Temperature and Time Controls in Food Preparation and Storage**

The Arizona Food Code 2000 recommends specific cooking, freezing, refrigeration, and reheating temperature and time parameters for a variety of foods. The primary focus is the destruction of organisms that have been known to cause food-borne illnesses.

Cooking specifications vary, dependent not only on the type of food (meat, fish, eggs, or poultry) but often on the condition of the food; therefore, the Arizona Food Code 2000 should be referenced.

Cooling requirements are also very specific. Food must be refrigerated at 41°F. Cooked potentially hazardous food shall be cooled from 60°C (140°F) to 21°C (70°F) within 2 hours. In addition to specific cooling temperature and time parameters, the Food Code also has recommended other cooling methods. Examples include:

- use shallow pans
- separate food into smaller or thinner portions
- use containers to facilitate heat transfer
- use ice as an ingredient.

As with cooking, reheating recommendations have variations. In general, all parts of food reheated in conventional ovens should reach a temperature of 74 degrees C (165 degrees F) for at least 15 seconds. In microwaves, the temperature is raised to 88 degrees C (190 degrees F) and the food must be covered and allowed to stand for 2 minutes.

**Cross Contamination**

Cross contamination can occur in a number of ways: from food to food, from utensils to food, from equipment to food, etc. The main concern is during the preparation of unlike foods, which are prepared using the same utensils or equipment. Animal foods, such as meats, should not be stored, cut, cleaned, or mixed in containers that are used for vegetables or fruits. The reverse is also true. When animal foods are being prepared, fruits and vegetables awaiting preparation should not be located on the same counter or cutting board. Utensils, knives, spoons, spatulas, etc., used in the preparation of animal foods, should not be used in preparation of fruits and vegetables, unless they have been sanitized with a sanitizing solution. The same contamination prevention technique should be used with any equipment, cutting boards, mixing bowls and pans, which can be used in the preparation of the different food types, animal foods, fruits, and vegetables.

**Housekeeping**

Good housekeeping is essential for the reduction of hazards in a dining facility operation.

- Floors must be kept clean and free from obstructions.
- Minimize accumulated waste, soiled towels, utensils and other materials to reduce hazards and contamination.
- Spills of any type must be removed immediately to prevent accidents.
• Broken glass or china must be swept up at once. Cracked or chipped dinnerware must be disposed of.
• Grease traps must be cleaned at frequent intervals.
• Pesticides, cleaning agents, poisons, or other substances that may contaminate food must be stored separately.
• Food items must be stored 6" above the floor.
• Food "Pull dates" must be closely watched.
• Drinking fountains/water coolers must be cleaned and sanitized daily.
• Floor mats should be swept daily, cleaned, and washed weekly.
• Warning signs or other means must be made to prevent employees or patrons from slipping when mopping floors.

Transporting Hot Food and Other Items
Kitchen personnel must ensure the area is free from obstructions before attempting to carry hot foods from one place to another; hot foods weighing more than 10 pounds must be transported on carts.

Personnel must not attempt to carry receptacles or objects that are too heavy for one person; use carts or dollies to prevent strains.

Hot Water Lines
All hot water lines in kitchen areas must be insulated when possible, to protect personnel against burns from accidental contact.

Machinery
All electrical equipment and machinery must be effectively grounded in accordance with the National Electrical Code.

All machinery must be operated in accordance with the manufacturer’s instructions. Control switches must be located so the operator can start or stop the machine without reaching across the point of operation. In addition, all machinery must be unplugged when not in use, or when being cleaned.

Only fully trained, authorized personnel shall operate slicing, grinding, mixing, or other food processing machines.

Machine Guarding
Adequate guarding of kitchen machinery is essential to safe operations. OSHA and ANSI standards apply. It is imperative that all machinery be cleaned immediately after use. Slicers not equipped with an automatic feed shall have pusher devices available to feed the machine. If possible, reciprocating blade slicers should be equipped with limit switches that prevent the machine from operation while knife head covers are open.

Cutters and choppers must be equipped with suitable covers that prevent the operators from contact with blades.

Cold Storage Rooms, Walk –In’s, and Refrigerators
All cold storage rooms must be equipped with no less than one door that can be opened from the inside. In the event that cold storage areas must be locked, an alarm activator must be put into the room or a push bar installed that will deactivate the locking mechanisms. "Walk-ins" and refrigerators must be cleaned and sanitized weekly.
**Soaps, Detergents, and Cleaning Compounds**

Soaps, detergents, and all cleaning compounds must be clearly marked and stored in locations to prevent being mistaken for food containers. Industrial soaps or detergents must not be used as hand cleansers, because of the harsh irritating effect to the skin. When necessary, the proper personal protective equipment must be worn to protect personnel from hazardous chemical cleaners.

**Kitchen Stoves, Ranges, and Griddles**

All stoves, ranges, and griddles must be installed and operated in accordance with the manufacturer's instructions. All stoves, ranges, and griddles must be thoroughly cleaned at intervals of not less than once a week. This requirement is in addition to the daily routine clean up which produces a sanitary environment.

The drop pans and grease troughs must be cleaned daily.

Hoods and vents must be used over stoves, ranges, and griddles. The exhaust system must be designed so that air velocities are sufficient to extract smoke and fumes generated from cooking operations. The exhaust system shall be fitted with filters that require frequent cleansing to prevent excessive accumulation of flammable grease.

Fire extinguishing systems that comply with the NFPA Standard 96 "Commercial Cooking Equipment, Ventilation" must be installed in each hood.

**Fire Safety**

Employees must be familiar with the proper way of activating all manual alarms and extinguishing systems.

**Microwave Ovens**

Employees must be instructed in the proper use of units. Microwave oven doors must seal properly and safety interlocks must be operational; each oven must be tested periodically for microwave leakage. Warning sign shall be posted to inform patrons that microwave ovens are in use on premises.

**FOOT PROTECTION**

The purchase and use of protective footwear shall comply with OSHA 29 CFR standard 1910.136. The OSHA standard states: "The employer shall ensure that each affected employee uses protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards."


Note: NOAO/NSO (expensed by your department) will reimburse employees up to $100.00 per year or up to $200.00 every two years for the purchase of protective footwear used in the course of their duties. Reimbursement will only be authorized for footwear that meets the selection criteria noted above.
FUELING CHECKLIST

- Is it prohibited to fuel an internal combustion engine with a flammable liquid while the engine is running?
- Are fueling operations done in such a manner that likelihood of spillage will be minimal?
- When spills occur during fueling operations is the spilled fuel washed away completely, evaporated or other measures taken to control vapors before restarting the engine?
- Are fuel tank caps replaced and secured before starting the engine?
- In fueling operations, is there always-metal contact between the container and the fuel tank?
- Are fueling hoses of a type designed to handle the specific type of fuel?
- Is it prohibited to handle or transfer gasoline in open containers?
- Are open lights, open flames, sparks or arcing equipment prohibited near fueling or transfer of fuel operations?
- Is smoking prohibited in the vicinity of fueling operations?
- Are fueling operations prohibited in buildings or other enclosed areas that are not specifically ventilated for this purpose?
- Where fueling or transfer of fuel is done through a gravity flow system are the nozzles of the self-closing type?

GENERAL WORK ENVIRONMENT CHECKLIST

- Are all work sites clean, sanitary, and orderly?
- Are work surfaces kept dry or appropriate means taken to assure the surfaces are slip-resistant?
- Are all spilled hazardous materials or liquids, including blood and other potentially infectious materials, cleaned up immediately and according to proper procedures?
- Are combustible scrap, debris and waste stored safely and removed from the work site promptly?
- Is all regulated waste, as defined in the OSHA blood-borne pathogens standard (29 CFR 1910.1030), discarded according to federal, state, and local regulations?
- Are accumulations of combustible dust routinely removed from elevated surfaces including the overhead structure of buildings, etc.?
- Is combustible dust cleaned up with a vacuum system to prevent the dust going into suspension?
- Is metallic or conductive dust prevented from entering or accumulating on or around electrical enclosures or equipment?
- Are covered metal waste cans used for oily and paint soaked waste?
- Is all oil and gas fired devices equipped with flame failure controls that will prevent flow of fuel if pilots or main burners are not working?
- Are paint spray booths, dip tanks, etc., cleaned regularly?
- Is the minimum number of toilets and washing facilities provided?
- Are all toilets and washing facilities clean and sanitary?
- Are all work areas adequately illuminated?
- Are pits and floor openings covered or otherwise guarded?
- Have all confined spaces been evaluated for compliance with OSHA’s 29 CFR 1910.146?

**HAND AND PORTABLE POWERED TOOLS**

Surprisingly enough, a large percentage of injuries experienced at work are because of hand tools. Either using the wrong hand tool for the job or using it incorrectly. For your personal safety, follow these basic hand tool guidelines.

- Always use the right tool for the task and follow manufacturer’s instructions.
- Use the personal protective equipment specified by the manufacturer’s instructions.
- Take the time to locate the right tool.
- Keep tools clean.
- Inspect power cords or hoses before use.
- Hoist tools by a bucket or hand line, not by power cord or hose.
- Never throw hand tools to another person, pass them.
- Dress the heads of chisels, pins, punches regularly.
- Keep screwdriver tips in a good condition.
- Carry tools in a tool belt or other safe means of transport.
- Use the correct size wrench for the nut.
- Use blade guards on knives.
- Store tools correctly, per manufacturer’s instructions.
- Inspect tools on a regular basis and rectify any deficiencies.
- Use explosive powered tools only if you have been trained and authorized to do so.
- Do not play practical jokes with hand tools.
- Never leave tools lying on top of a ladder or other elevated place.
- Pack tools away at the end of each shift.

YOUR MOST VALUABLE TOOLS ARE YOUR HANDS, TAKE CARE OF THEM!

**Personal Protective Equipment**

Personal protective equipment shall be worn to protect from the hazards involved with the use of tools. Hazards include, but are not limited to, flying particles or objects, dust, noise, and sharp or rough objects.

**Dead man Switches**

Handheld power equipment shall have a switch that automatically shuts off when pressure is not applied. Lock-on controls can be hazardous and should be removed. Power switches must be located and protected in such a way as to minimize the possibility of accidentally turning it on.

**Grounding**

Portable electric power tools must be grounded or double insulated, and UL approved.
Pneumatic Powered Tools

Pneumatic tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected.

Retainers shall be securely installed on impact on rotating tools to prevent attachments from being accidentally expelled from the barrel.

Tool hoses over 3/8 inch inside diameter shall have an excess flow check valve at the source of supply or branch line to shut off the air in the event of a hose or connection failure.

Compressed Air for Cleaning

Compressed air shall not be used for cleaning purposes, except under the following conditions:

- Air pressure ahead of the air gun is set to less than 30 pounds per square inch (psi) or by
- Use of an air gun with internal pressure reducers or relief device which reduces the pressure to less than 30 psi at the nozzle in the case of obstruction or dead-ending and then only with
- Effective guarding from flying chips or particles.

Compressed air shall not be used to "blow down" or clean oneself off at any time.

Fuel Powered Tools

Fuel-powered tools shall be shut down (engine stopped) during refueling or servicing. Smoking is prohibited during the use of such tools.

Adequate ventilation shall be provided for when fuel powered tools are used indoors or in insufficiently ventilated areas.

Power Lawn Mowers

Power lawn mowers shall meet ANSI requirements.

Power-driven chains, belts, and gears should be so positioned or otherwise guarded to prevent the operator's accidental contact with them during normal starting, mounting, and operation of the machine.

A shut-off device should be provided to stop operation of the motor or engine. This device must require manual and intentional reactivation to restart the motor or engine.

All positions of the operating controls need to be clearly identified with the following:

CAUTION BE SURE THE OPERATING CONTROL (S) IS (ARE) IN NEUTRAL BEFORE STARTING THE ENGINE
Alternatively, similar wording must be clearly visible at an engine starting control point on self-propelled mowers.

HAND TOOLS AND EQUIPMENT CHECKLIST FOR MANAGERS OR SUPERVISORS

☐ Do employees use all tools and equipment in good condition at their workplace (both company and employee owned)?

☐ Are hand tools such as chisels and punches, which develop mushroomed heads during use, reconditioned or replaced as necessary?
Are broken or fractured handles on hammers, axes and similar equipment replaced promptly?

Are worn or bent wrenches replaced regularly?

Are appropriate handles used on files and similar tools?

Are employees made aware of the hazards caused by faulty or improperly used hand tools?

Are appropriate safety glasses, face shields, etc. used while using hand tools or equipment that might produce flying materials or be subject to breakage?

Are jacks checked periodically to ensure they are in good operating condition?

Are tool handles wedged tightly in the head of all tools?

Are tool cutting edges kept sharp so the tool will move smoothly without binding or skipping?

Are tools stored in dry, secure location where they will not be tampered with?

Is eye and face protection used when driving hardened or tempered studs or nails?

HAZARDOUS CHEMICAL EXPOSURE CHECKLIST

Whenever possible are hazardous substances handled in properly designed and exhausted booths or similar locations?

Do you use general dilution or a local exhaust ventilation system to control dust, vapors, gases, fumes, smoke, solvents or mists which may be generated in your workplace?

Is ventilation equipment provided for removal of contaminants from such operations as production grinding, buffing, spray painting, and/or vapor degreasing and is it operating properly?

Do employees complain about dizziness, headaches, nausea, irritation or other factors of discomfort when they use solvents or other chemicals?

Is there a dermatitis problem? Do employees complain about dryness, irritation or sensitization of the skin?

Have you considered the use of an industrial hygienist or environmental health specialist to evaluate your operation?

If internal combustion engines are used, is carbon monoxide kept within acceptable levels?

Is vacuuming used, rather than blowing or sweeping dust whenever possible for clean up?

Are materials that give off toxic asphyxiate, suffocating or anesthetic fumes, stored in remote or isolated locations when not in use?

HAZARDOUS SUBSTANCES COMMUNICATION CHECKLIST

Is there a list of hazardous substances used in your workplace?

Is there a current written exposure control plan for occupational exposure to blood-borne pathogens and other potentially infectious materials, where applicable?
Is there a written hazard communication program dealing with Material Safety Data Sheets (MSDS), labeling and employee training?

Is each container for a hazardous substance (i.e., vats, bottles, storage tanks, etc.) labeled with product identity and a hazard warning (communication of the specific health hazards and physical hazards)?

Is there a Material Safety Data Sheet readily available for each hazardous substance used?

Is there an employee-training program for hazardous substances?

Does this program include?

An explanation of what an MSDS is and how to use and obtain one?

MSDS contents for each hazardous substance or class of substances?

Explanation of “Right to Know?”

Identification of where an employee can see the employers written hazard communication program and where hazardous substances are present in their work areas?

The physical and health hazards of substances in the work area and specific protective measures to be used?

Details of the hazard communication program, including how to use the labeling system and MSDS’s?

Are employees trained in the following?

How to recognize tasks that might result in occupational exposure?

How to use work practice and engineering controls and personal protective equipment and to know their limitations?

How do you obtain information on the types, selection, proper use, location, removal, handling, decontamination and disposal of personal protective equipment?

Do you know who to contact and what to do in an emergency?

**HOIST AND AUXILIARY EQUIPMENT CHECKLIST**

Is each overhead, electric hoist equipped with a limit device to stop the hook travel at its highest and lowest point of safe travel?

Will each hoist automatically stop and hold any load up to 125 percent of its rated load if it’s actuating force is removed?

Is the rated load of each hoist legibly marked and visible to the operator?

Are hoists inspected on a monthly basis?

Are stops provided at the safe limits of travel for trolley hoist?

Are the controls of hoist plainly marked to indicate the direction of travel or motion?

Is each cage-controlled hoist equipped with an effective warning device?

Are close-fitting guards or other suitable devices installed on the hoist to assure hoist ropes will be maintained in the sheave groves?
Are all hoist chains or ropes of sufficient length to handle the full range of movement of the application while still maintaining two full wraps on the drum at all times?

Are nip points or contact points between hoist ropes and sheaves that are permanently located within 7 feet (2.13 meters) of the floor, ground or working platform, guarded?

Is it prohibited to use chains or rope slings that are kinked or twisted?

Is it prohibited to use the hoist rope or chain wrapped around the load as a substitute, for a sling?

Is the operator instructed to avoid carrying loads over people?

**HOUSEKEEPING**

Good housekeeping is the foundation of a safe, healthy and pleasant workplace. It is essential that all areas be kept clean, orderly, and with all necessary things in the proper places. This improves safety, efficiency and quality at the same time. Good housekeeping is a day-to-day activity and should not be viewed as a separate task or something to do after the shift. Clean up time is all the time! Employees are responsible for housekeeping in their area. Employees should be aware of hazards arising from poor housekeeping. Conditions that cannot be immediately rectified should be reported to the manager or supervisor.

**Housekeeping Guidelines**

- Keep work areas neat and clean. Tripping or slipping hazards such as tools, materials and spills should be corrected immediately.
- Store tools safely. Place equipment and supplies in their correct places.
- Keep stairways, hallways, and other walkways free of debris, hoses and other obstructions. Put trash in approved containers.
- Bend over or remove protruding objects such as nails, spikes, wire or other sharp points.
- Keep workbenches and stations free from items that are not being used or worked on at present.
- Place oily rags in the metal containers provided.
- Paper cups, plates, and lunch debris, including trash must be thrown in the appropriate trashcans.
- To avoid skin irritations, wash frequently, using soap and water. Wear gloves when handling substances that may cause irritation.
- Keep all underground travel ways clear of stored material.
- The inside of all vehicles should be kept clean and free from excessive, unnecessary items.
- Cigarette butts belong in containers provided.
- Spitting of tobacco and seeds in work areas and offices is strictly prohibited.

**Employee’s Housekeeping Responsibility**

Good housekeeping is a team effort and a team is made up of individuals. The individual employee’s responsibility is as follows:

- Keep work areas clean, neat, tidy and free from excessive material at all times.
- Clean machines and equipment after each shift and to keep them clean during the shift.
- Constantly put trash in the proper trash bins, put scrap in the scrap bins and recyclable materials in the designated bins with lids.
• Keep the floors free from excessive material.
• Ensure that aisles and walkways are clear, unobstructed and in good order.
• Ensure that materials are stacked correctly and safely in the correct places.
• Do an informal housekeeping inspection of the area on a daily basis and to rectify housekeeping hazards.
• Monitor that no items are stacked in no stacking areas such as under fire equipment and electrical switchgear.
• Report faded housekeeping notices and signs.
• Always return tools to their correct place after use.
• Ensure that spill and other tripping/slipping hazards are cleaned up or fixed.

REMEMBER, A PLACE FOR EVERYTHING AND EVERYTHING IN ITS PLACE, ALWAYS!

Golden Housekeeping Rules
These few simple rules, when applied, will help maintain housekeeping at all times.

• If you remove something, replace it.
• If you unlock it, lock it.
• If you open it, close it.
• If you switched it on, did you switch it off?
• If you break it, fix it, if you borrowed it, look after it, if you use it, look after it as if it were yours.
• If it is not yours, ask permission first, if you have not been trained to do it, do not do it, do not interfere if it does not concern you.
• If you spill it, wipe it up.
• If you mess up, clean up, if you remove, replace.
• To get others to follow, set the example.
• You are the champion of good housekeeping.
• Teach others that neatness is an important part of maintaining a safe environment.

HYDRAULIC SYSTEMS

Hydraulic systems have some special characteristics that distinguish them from other types of mechanical operating systems.

Hydraulic attachments on construction equipment are held in position by a trapped column of oil in the cylinders and lines. If the hydraulic oil escapes, the attachment will fall.

Follow these tips before servicing construction equipment hydraulic systems:

• Prior to making adjustment or repairs on the hydraulic system, make sure the ground, blocking, or cribbing is supporting the attachment, not the oil.

• The hydraulic system may hold pressure for a long period of time after the engine has been shut down. Removal of plugs or lines may result in oil and the component shooting out with explosive force. Always release system pressure before making repairs or adjustments.
• Pressurized hydraulic oil escaping the system through a leak can be almost invisible. Never search for an oil leak with your bare hands. A pressurized oil leak can penetrate the skin and cause serious injury. Use a piece of cardboard or wood when searching for suspect leaks.

• Pressurized hydraulic tanks become heated during operation; this can cause pressure to build up in the tank. Too-quick removal of the cover may cause the hot air and oil to escape rapidly. The oil may be very hot and cause severe burns. Bleed off the pressure before removing the cover. Consult the manufacturer’s instructions.

• Pressurized oil leaks spraying on a hot engine can be an invitation to disaster. Accumulated oil and fuel from leaks on the machine can result in a fire that can spread with explosive speed. Keep the machine clean and free of leaks.

• Never attempt to service or repair a hydraulic system if you do not know what you are doing. They are unforgiving and can cause serious injuries or death.

• Never work under a hydraulic attachment that is supported on the oil system.

Always follow the manufacturer’s instructions for correct procedures, and never work under hydraulic attachments that are supported by the oil.

INDUSTRIAL TRUCKS – FORKLIFTS CHECKLIST

☐ Are only employees who have been trained in the proper use of hoists allowed to operate them?

☐ Are only trained personnel allowed to operate industrial trucks?

☐ Is substantial overhead protective equipment provided on high lift rider equipment?

☐ Are seat belts provided and worn?

☐ Is the required lift truck operating rules posted and enforced, if required?

☐ Is directional lighting provided on each industrial truck that operates in an area with less than 2-foot candles per square foot of general lighting?

☐ Does each industrial truck have a warning horn, whistle, gong, or other device which can be clearly heard above the normal noise in the areas where operated?

☐ Are the brakes on each industrial truck capable of bringing the vehicle to a complete and safe stop when fully loaded?

☐ Will the industrial trucks’ parking brake effectively prevent the vehicle from moving when unattended?

☐ Are industrial trucks operating in areas where flammable gases or vapors, or combustible dust or ignitable fibers may be present in the atmosphere, approved for such locations?

☐ Is motorized hand and hand/rider trucks so designed that the brakes are applied, and power to the drive motor shuts off when the operator releases his or her grip on the device that controls the travel?
Are industrial trucks with internal combustion engine, operated in buildings or enclosed areas, carefully checked to ensure such operations do not cause harmful concentration of dangerous gases or fumes?

Are powered industrial trucks being safely operated?

**KEEP YOUR BACK INJURY FREE**

Many tasks require routine lifting activities. Lifting the wrong way can lead to serious back injuries. The following guidelines are given for safe lifting and should be followed each time you lift irrespective of the weight or size of the load being lifted.

- The first choice is always, "Can this load be lifted or moved mechanically?"
- If in doubt as to the weight or your own lifting capabilities, get help.
- Plan the lift ahead.
- Gently stretch the muscles to warm up before a lift
- Only lift and carry what you can safely handle
- Keep the back straight, bend your knees
- Avoid twisting or reaching while lifting or carrying.
- Carry the load close to your body to reduce strain.
- Elbows close to your sides.
- Lower loads slowly, bending the knees at the same time.
- Ensure you can see over the top of the load at all times.
- Ensure a safe footing when lifting.
- When carrying a load, check that the walkway is clear.
- Set the load down in the same manner.
- If using a push cart, push don’t pull
- Get help if needed.

**LADDER SAFETY**

Every year people are injured because of ladder accidents. Falls and other accident types are only because of two situations with ladders:

1. Using a ladder that is in an unsafe condition.
2. Using a ladder for the wrong application.

These basic ladder safety rules will ensure that the two above main accident causation factors are eliminated.

Users are responsible for inspecting ladders before they are used. If any defects are found, the ladder shall not be used and removed from service and tagged "Dangerous, Do Not Use". An irreparable ladder shall be destroyed.

The following items should be considered before using a ladder:

- Condition of rungs and uprights.
- Non-slip feet or retainers.
• Spreaders, ropes and hinges.
• Firmness of ladder, does it wobble?
• Is this the right ladder for the task?
• Is fall protection required?
• Check and recheck before using.
• Is the footing level and unobstructed, free of slipping hazards?
• Defective ladders should not be used and should be taken out of service immediately.
• Use the correct length ladder. Ladders should extend a minimum of 3 feet above the access area.
• Stepladders shall not be used as straight ladders.
• Ladders are not walking boards!
• Use a rope to haul tools etc. up to the elevated work platform.
• Climb a ladder with both hands.
• Never “walk”, a ladder; get down and move it.
• Straight ladders must be placed with the ratio of 1-ft. horizontal distance for every 4-ft. vertical height.
• Place ladders correctly to avoid leaning. [Keep your belt buckle between the uprights or keep your body in the center of the ladder, no leaning out from the ladder].
• Ladders must have some form of anti-slip feet.
• Tie straight ladders at the top to keep them secure.
• Always face the ladder when climbing up or down.
• Do not place ladders in front of doorways or other traffic areas. If you must, place a guard or lock the entrance or passage.
• Never stand on the top two rungs of a ladder.
• Wood or fiberglass ladders should be used near electrical conductors.
• Metal ladders should never be used near electrical switchgear or conductors.
• Only one person on the ladder.
• No homemade ladders.

LASERS

Lasers (light amplification by stimulated emission of radiation) are devices capable of converting light or electrical energy into a focused, high-energy beam. Laser light is monochromatic, or contains a single light frequency, and does not spread out very far over long distances. Normal or “white” light, on the other hand, contains many different frequencies, as apparent in a rainbow, and travels in all directions away from the source.

Laser use is common in today's society and lasers affect everyone. Lasers are routinely used in entertainment, communications, construction, medicine, welding, surveying, chemical analysis, and manufacturing. CD-ROM players and checkout scanners in grocery stores are examples of laser applications in our everyday lives.

Laser Classifications

Lasers are classified based on their hazard potential. Laser manufacturers are required to clearly label this classification on the laser casing.

Class I, II, and IIa lasers called low power lasers pose little risk to users. The beam of this type of laser is so bright that an individual’s natural blink reflex prevents one from staring at the beam long enough for injury to occur.
Class IIIa, IIIb and IV lasers are known as medium and high-powered lasers respectively and potentially pose a greater risk. Because lasers focus energy into a very small area, the skin and eyes are most vulnerable. Thermal burns are the most common type of damage caused by exposure to lasers.

**Hazards Associated with Lasers**

Directly viewing laser light is particularly hazardous. The normal function of the human eye is to collect light and focus it onto the retina, the vision cells on the back of the eye. Similar to how a magnifying glass can focus intense sunlight and burn paper, the eye focuses laser energy onto the retina (by as much as 100,000 times). Looking at high-powered laser beams without proper eye protection, even for brief periods, will cause permanent damage or burns the vision cells of the eye. Extensive damage will result in irreversible blindness.

Some high-powered lasers are particularly hazardous because their beams may be invisible. High-powered laser systems also pose an electrical hazard. Several fatalities have been documented associated with electrocution or explosions resulting from the misuse of high-powered lasers around flammable materials.

**Laser Safety and Control**

To assure the safe use and operation of lasers, be sure you are aware of the following guidelines:

- Never look directly into the beam of a laser regardless of its classification or your exposure duration.
- Wear laser eye protection appropriate for the laser being used. Check goggles periodically to ensure that the protective characteristics are intact. Normal eye wear or safety glasses will not be sufficient.
- Be aware of where lasers are used in your work area. Signs and placards are posted for your protection.
- Know the class of lasers you work with.
- Always use the laser with the lowest classification possible. That is never use a high power laser when a low power laser will do.
- Never attempt to open, repair or relocate a laser. Leave this job to properly trained technicians.
- For high-powered lasers, be familiar with and follow written operating procedures.
- Lasers can be reflected off metal surfaces or mirrors often with little loss of intensity, therefore study the intended path before energizing the laser.
- Be aware of toxic fumes or flying particles that might be produced from target area.
- Contain the laser beam as much as possible by using light traps, fireproof for the energy density involved.
- Work in well-lighted areas to constrict your eye pupils.
- Do not use lasers at eye level (4 to 6 ft from floor).

**LIFTING GEAR, BOOMS AND CRANES**

Lifting heavy items is a daily activity in the workplace and this activity creates a hazard to people and equipment in the vicinity of the lift. As with most industrial activities, the degree of risk can be reduced by adhering to a few basic principles and rules. Once an item is raised by a crane and lifting tackle, it has stored energy, which if inadvertently released, could result in loss.

You can play a major role in ensuring lifting gear and crane safety by following these basic lifting rules. Share them with your fellow employees:
• Operate lifting apparatus for which you have been trained
• The rated load limit shall be plainly marked on the crane.
• Cranes shall be inspected and maintained before use.
• Never stand, or pass under, a suspended load.
• Do not place any part of your body under a suspended load, even for a second.
• Check the weight before every lift; check the lifting gear’s capacity as well.
• Do not tie knots in steel ropes, slings or chains.
• Rusty, dirty and damaged slings are potential accidents! Discard them.
• Inspect your lifting gear on a regular basis, and before use.
• Never use signs of tipping to determine if a load is within your crane’s capacity.
• Man lifts are for people only. Use fall protection and tie off at all times in man lifts.
• Store slings, shackles etc. in a dry pre-determined storage area.
• Lifting gear is for lifting...not towing!
• Do not leave gear lying on the floor.
• Crane outriggers, if provided, must be used for all lifts.
• Gain understanding as to what crane signals will be used.
• Only one person is to issue instructions to a crane operator during a lift.

Lifting Booms

• Never get under a boom that is being repaired or assembled. It can fall without warning.
• Never use boom sections with bent lattice members.
• Never use a boom with bent or damaged chords.
• Always block booms when assembling them.
• Be sure all boom insert connection pins are installed before raising any boom being assembled.
• Always check telescopic booms for sway, droop or crack.

LOCKOUT / TAG OUT PROCEDURES CHECKLIST

☐ Is all machinery or equipment capable of movement, required to be de-energized or disengaged and locked-out during cleaning, servicing, adjusting or setting up operations, whenever required?

When the power “disconnecting means” for equipment does not also disconnect the electrical control circuit:

☐ Are the appropriate electrical enclosures identified?

☐ Are means provided to assure the control circuit can also be disconnected and locked-out?

☐ Is the locking-out of control circuits in lieu of locking-out main power disconnects prohibited?

☐ Are all equipment control valve handles provided with a means for locking-out?

☐ Does the lock out procedure require that stored energy (mechanical, hydraulic, air, etc.) be released or blocked before equipment is locked-out for repairs?

☐ Are appropriate employees provided with individually keyed personal safety locks?

☐ Are employees required to keep personal control of their key(s) while they have safety locks in use?
Is it required that only the employee exposed to the hazard, place or remove a safety lock?

Is it required that employees check the safety of the lockout by attempting a startup after making sure no one is exposed?

Are employees instructed to always push the control circuit stop button immediately after checking the safety of the lockout?

Is there a means provided to identify any or all employees who are working on locked-out equipment by their locks or accompanying tags?

Are a sufficient number of accident preventive signs or tags and safety padlocks provided for any reasonably foreseeable repair emergency?

When machine operations, configuration or size requires the operator to leave his or her control station to install tools or perform other operations, and that part of the machine could move if accidentally activated, is such element required to be separately locked or blocked out?

In the event that equipment or lines cannot be shut down, locked-out and tagged, is a safe job procedure established and rigidly followed?

LOCKOUT, TAG OUT, TRYOUT, FOR YOUR PROTECTION

Whenever a machine or system requires maintenance or repair, the sources of energy feeding that machine or system must be turned off and locked in the off position to protect the repair crew from accidental start up of the equipment.

The energy sources may be one or a combination of electrical, pneumatic, hydraulic, mechanical, or gravity. All sources must be isolated and locked in the off position with locks issued as part of the company’s lockout standard. Stored energy must be released before work commences.

Lockout protects the worker who identifies the sources of energy, locks them out and tags the controls with a tag prescribed in the standard. Before any work is carried out, the circuits are tested/ried out to reconfirm that the correct ones have been isolated.

The lockout tag also warns others in the area who locked out the machine and why. Only the person who placed the lock and tag/or the designated employee performing the lock out can remove the lock.

Cutting or otherwise removing a lockout device that is not yours is a breach of one of the cardinal safety rules and will result in disciplinary action.

Only authorized and qualified personnel can lock out. If you are not authorized but need a machine locked out, contact your manager for advice. If you are not authorized to lock out – tagout, you are not authorized to repair or dismantle or provide maintenance on machinery.

Lockout Procedure Steps for Authorized Personnel

- Make sure you or members of the team are authorized to lock out. If not get help!
- Identify the correct piece of equipment.
- Identify all sources of stored energy, [pressure, gravity, electrical static or charge etc.]
- Switch off all sources after obtaining clearance to do so.
- Lock all controls in the "OFF", position.
- Fill out and hang tags. Fasten securely.
- Test all controls to ensure the equipment is de-energized, and then recheck.
- Ensure all guards are replaced and everything is in order before restarting this machine.
- When the task is complete, warn all in the vicinity that you are about to restart the machine.

MACHINE GUARDING CHECKLIST

- Is there a training program to instruct employees on safe methods of machine operation?
- Is there adequate supervision to ensure that employees are following safe machine operating procedures?
- Is there a regular program of safety inspection of machinery and equipment?
- Is all machinery and equipment kept clean and properly maintained?
- Is sufficient clearance provided around and between machines to allow for safe operations, set up and servicing, material handling and waste removal?
- Is equipment and machinery securely placed and anchored, when necessary to prevent tipping or other movement that could result in personal injury?
- Is there a power shut-off switch within reach of the operator’s position at each machine?
- Can electric power to each machine be locked out for maintenance, repair or security?
- Is the non-current carrying metal parts of electrically operated machines bonded and grounded?
- Are foot-operated switches guarded or arranged to prevent accidental actuation by personnel or falling objects?
- Are manually operated valves and switches controlling the operation of equipment and machines clearly identified and readily accessible?
- Are all emergency stop buttons colored red?
- Are all pulleys and belts that are within 7 feet (2.13 meters) of the floor or working level properly guarded?
- Are all moving chains and gears properly guarded?
- Are splashguards mounted on machines that use coolant to prevent the coolant from reaching employees?
- Are methods provided to protect the operator and other employees in the machine area from hazards created at the point of operation, in-going nip points, rotating parts, flying chips, and sparks?
- Are machinery guards secure and so arranged that they do not offer a hazard in their use?
- If special hand tools are used for placing and removing material, do they protect the operator’s hands?
- Are revolving drums, barrels, and containers required to be guarded by an enclosure that is interlocked with the drive mechanism, so that revolution cannot occur unless the guard enclosures are in place, so guarded?
Do arbors and mandrels have firm and secure bearings and are they free from play?

Are provisions made to prevent machines from automatically starting when power is restored after a power failure or shutdown?

Are machines constructed so as to be free from excessive vibration when the largest size tool is mounted and run at full speed?

If machinery is cleaned with compressed air, is air pressure controlled and personal protective equipment or other safeguards utilized to protect operators and other workers from eye and body injury?

Are fan blades protected with a guard having openings no larger than ½ inch (1.27 centimeters), when operating within 7 feet (2.13 meters) of the floor?

Are saws used for ripping, equipped with anti-kick back devices and spreaders?

Are radial arm saws so arranged that the cutting head will gently return to the back of the table when released?

MACHINE SAFETY

Machines make work easier and more efficient. However, they introduce a risk to the operator if not operated correctly. For your protection, machines have machine guards or other means to ensure you do not come into contact with moving parts. Always read, understand, and follow the machines manufacturers’ instruction manual for proper usage.

Always respect machines as they have the ability to cause permanent and severe injuries if the rules and procedures are not followed, especially during inspection and maintenance periods. Some of the machine hazards in your work area may include:

- Power lifts, man lifts, conveyors, and forklifts.
- Welding machines, buffers presses and grinders.
- Boring machines, drills and compressors.
- Saws, guillotines, cutters, and winding and hoisting mechanisms.
- Grinding wheels.
- Inspection devices.
- Earth moving equipment
- Radioactive sensing devices.
- Electromechanical devices.

Respect Machine Guards

Machine guards form a barrier between you and potential pinch points and help reduce the possibility of contact with these moving parts.

- Guards must always be fixed in place.
- Lockout and try out before removing a guard.
- Respect interlocks guards, mechanical and electrical.
- Refer to machine instruction manuals for proper usage.
Types of Guards

- **Fixed Guards**: These include fences, gates and protective covers. They provide a barrier between the operator and the pinch point.
- **Interlock Guards**: These guards disconnect the power as soon as a barrier or device is removed.
- **Automatic Guards**: These guards guard the danger by automatically introducing a barrier between the danger and the operator before they will operate.

Machine Safety Guidelines:

- Make yourself familiar with the operating manual for all machinery in your work area.
- Never remove guards or operate a piece of equipment without proper guarding.
- Never reach around or under a guard.
- Do not make holes in guards or reduce their efficiency in any way.
- Always report a missing or inadequate guard.
- Remember, lock out, tag out, and try out before removing a guard.
- Ensure guards are securely fastened in place.
- Do not wear loose clothing and/or jewelry near moving machinery.
- Inspect guards on a frequent basis.
- If you have any doubt, ask!

**MATERIAL HANDLING CHECKLIST**

- Is there safe clearance for equipment through aisles and doorways?
- Are aisle ways designated, permanently marked and kept clear to allow unhindered passage?
- Are motorized vehicles and mechanized equipment inspected daily or before use?
- Are vehicles shut off and brakes set before loading and unloading?
- Are containers of combustibles or flammables, when stacked while being moved, always separated by dunnage (materials used for the stowage and protection of cargo) sufficient to provide stability? Are dock boards (bridge plates) used when loading or unloading operations are taking place between vehicles and docks?
- Are trucks and trailers secured from movement during loading and unloading operations?
- Are dock plates and loading ramps constructed and maintained with sufficient strength to support imposed loading?
- Are hand trucks maintained in safe operating condition?
- Are chutes equipped with sideboards of sufficient height to prevent the material being handled from falling off?
- Are chutes and gravity roller sections firmly placed or secured to prevent displacement?
- At the delivery end of the rollers or chutes, are provisions made to break the movement of the handled materials?
- Are pallets usually inspected before being loaded or moved?
Are hooks with safety latches or other arrangements used when hoisting materials so that slings or load attachments will not accidentally slip off the hoist hooks?

Are securing chains, ropes, chokers or slings adequate for the job to be performed?

When hoisting material or equipment is provision made to assure no one will be passing under the suspended loads?

Are material safety data sheets available to employees handling hazardous substances?

**MEANS OF EGRESS**

Fire in a building calls for prompt action to evacuate occupants safely. Other emergencies that require prompt evacuation are chemical spills, and leaking compressed gas cylinders. Obstruction to passageways can create serious hazards in case of fire, explosion, loss of lights, or other emergency situations. Corridors are specifically constructed to retard the spread of fire and to provide a protective envelope to allow people to reach the outside. When flammable materials are stored in the corridors, this design is defeated.

Exit areas, corridors, aisles, and passageways must be kept clear at all times with no obstruction across or in aisles that could create a hazard. The proper maintenance of aisle ways, corridors and exits is extremely important. Some examples of the most common items found in hallways are carts, freezers, boxes, laboratory equipment, and furniture.

Permanent aisles and passageways require appropriate marking. In shops or general storage areas, lines must be painted on the floor, at least 28 inches apart, to indicate where the permanent aisles are.

Where mechanical handling equipment is used, sufficient safe clearance should be provided for aisles at loading docks, through doorways and wherever turns or passage must be made.

Exit doors shall not be obscured or concealed in any way. Mirrors or draperies on exit doors are particularly hazardous.

A door designed for fire exit purposes must be kept closed and not secured in the open position. This is especially important in stairways. When doors are held open, the smoke moves into the stairways and prevents people from using the stairway to escape.

Space under stairs is prohibited from use for any purpose, especially storage.

**MOBILE EQUIPMENT AND FORK TRUCKS**

Your work area has numerous vehicles in and around it constantly, from specialized tractors, fork trucks, hauls trucks, to passenger cars and trucks. As on the highways, certain rules apply on company property and the chances of accidents happening will be reduced if the following rules, as well as the normal rules of the road, are followed.
Always wear seat belts while in a vehicle.
Do not operate any equipment unless you have been trained and licensed to do so.
No horseplay while operating a vehicle.
Equipment that operates at night must have proper headlights and taillights.
Complete the vehicle checklist BEFORE operating the vehicle. Passenger shuttle vehicles are excluded from this requirement.
If safety defects are found, get them fixed before operating the equipment.
Observe and obey all traffic signs.
Front loaders must park with the bucket on the ground and parking brake set.
Ensure that loads are secure and cannot fall out.
Use the horn for warning purposes only.
Some vehicles do not accommodate passengers, do not offer rides!
Park vehicles at least 8 feet from railroad tracks.
Do not ride in buckets, flat beds, on forks or on any part of equipment not intended for passengers.
Check loading dock chocks before driving into or onto cars or trucks being loaded.
Speed limits must be obeyed at all times.
Do not allow any body part to protrude from a vehicle that is operating.
Only specially approved man baskets shall be used on the fork truck as a work platform.
Fire extinguishers on the equipment must be checked at the beginning of each shift. Passenger shuttle vehicles are excluded from this requirement.
Fuel tanks shall not be filled with the engine running.
Portable gas containers shall be removed from any vehicle and placed on the ground before filling. If you are unable to remove the container, proper grounding cables shall be attached.
Vehicles shall not be left unattended unless parking brakes are set and the engine is turned off.
Never mount or dismount any moving vehicle.
Use at least the three-second rule when following a vehicle in normal day-to-day traffic.
Always signal before making a lane change or moving.
Come to a complete stop at stop signs.
Inspect your vehicle before operating.

MOTOR VEHICLE SAFETY

This section includes the requirements/rules and responsibilities for the safe operation of company vehicles and rentals when used during company business. No NOAO/NSO vehicle shall be used for personal use.

NOAO/NSO vehicles are for use by NOAO/NSO personnel and authorized visitors who have a valid State or International driver’s license and a GSA driver’s license.

Drivers of any company vehicle transporting hazardous materials shall possess a Commercial Driver's License with a hazardous materials endorsement.

Driver’s requiring a Commercial Driver's License are periodically required to have a DOT physical exam and shall, prior to each trip, certify that the vehicle is safe by completing a pre-trip inspection checklist.
For your safety and in the event of an emergency, shuttle vehicles are equipped with a radio, fire extinguisher, first-aid kit, accident reporting packet located in the glove box, insurance identification card, and emergency items including tire chains, flares, and other warning devices.

Any citations, fines, or confinement resulting from violation of existing laws/statutes by an employee or an authorized visitor operating a company vehicle, or a personal or rental vehicle when connected with NOAO/NSO business, shall be the personal responsibility of the individual, and may result in the loss of driving privileges and other actions.

The driver to their supervisor, the site facilities manager, and the risk management specialist shall report all motor vehicle accidents and or property damage that involve a NOAO/NSO vehicle or rental, no matter how minor. The driver must fill out the accident report form located in the glove box and/or a NOAO/NSO incident report form.

**Motor Vehicle - Before You Go Checklist**

- Only authorized employees and visitors shall operate and ride in company vehicles.
- Make sure you have in your possession a current and valid driver’s license and your valid GSA license before operating any company vehicle, which can be found on the NOAO/NSO Intranet at http://www.noao.edu/kpno/forms/autoid/.
- Drive only the type of vehicle that you are authorized or qualified to drive, most special purpose vehicles require additional training, procedures, certification and documentation.
- Know and obey state and local laws applicable to the vehicle being operated.
- No drinking alcoholic beverages and then driving, the consequences are too great for you and the company.
- Illegal drugs and alcoholic beverages shall not be transported in company vehicles.
- Be aware of severe weather conditions and warnings, plan your travel accordingly.
- Become familiar with the vehicle. If you have questions about the vehicle you are driving, please ask someone before you drive.
- Adjust the mirrors and other equipment before you go.
- Make sure that the windows and mirrors are clear of obstructions like ice or mist.
- Do not tamper with any safety, pressure sensing, or limiting device. Only authorized employees or vehicle maintenance contractors shall adjust such devices.
- Review the instrument panel and check the fuel level before departure.
- No one shall ride on any part of a vehicle except on the seats. No one shall be allowed to ride on, in a trailer, or in the box of a pick-up truck.
- Drivers and passengers in company vehicles or rental vehicles, where provided, shall wear seat belts and shoulder harnesses, whenever the vehicle is in motion on public or private roadways.
- Driver or passenger compartments shall not be used to transport loose material that should be carried and tied down in compartments, portions or sections of the vehicle designated for that purpose.
- Do not tie, strap, carry or hang equipment or materials on the exterior of a vehicle or trailer not specifically designed for that purpose.
- Do not load vehicles with materials and or people beyond the rated capacity; in certain instances, oversized loads require special permitting.
- Promptly report any vehicle problem or safety related deficiency encountered during the operation of a vehicle.
- If you are a passenger and/or observe unsafe driving practices please ask the driver to comply with your request and/or report it.
Ignition systems shall be turned off and no smoking permitted while refueling.

Motor Vehicle – Radio Communications

Within Tucson, tune communications radio to Channel 2. (Switch to channel 1 when ½ way to Kitt Peak area)
Within Kitt Peak area, tune communications radio to Channel 1 (Switch to channel 2 when ½ way to Tucson area)

Motor Vehicle - On the Road Checklist

- Obey all traffic laws and signs.
- No hitchhikers shall be transported in company vehicles.
- Do not release the vehicle to any unauthorized person.
- Drivers shall be courteous toward other drivers and pedestrians and yield the right of way to pedestrians and other vehicles.
- No job is so important that it requires operation of a vehicle in any manner that is considered unlawful or unsafe. An emergency call does not permit a driver to disregard traffic laws or established procedures.
- Drivers shall clearly signal their intention of turning, passing or stopping, always using defensive driving techniques.
- Watch for road obstructions such as rocks, landslides and wildlife.
- Drive at speeds permitted by law. Traffic, road, and weather conditions shall be considered when determining the safe operating speed. For example, in bad weather conditions, reduce your speed to the following guidelines:
  - When driving on wet roads, reduce your speed by at least one-third.
  - When driving on snow and ice, reduce your speed by at least one half.
  - When driving in bad weather, at least double the following distance from the vehicle in front of you.
- Drivers shall use caution on down grades; passenger vehicles should use the next lower gear to help maintain speed and minimize use of brakes.
- Drivers shall use caution on downgrades and use the proper gears; heavily loaded passenger vehicles or trucks shall be operated in the same gear needed to go up the same grade.
- Drivers shall not allow vehicles to coast with the transmission in neutral or with the clutch disengaged.
- When vehicles must be parked on a roadway, they shall be parked facing the direction of traffic flow.
- When parking on a hill, drivers shall:
  - If the front of the vehicle is facing downhill, turn the front wheels into the curb or toward the side of the road.
  - If the front of the vehicle is facing uphill, turn the wheels away from the curb and let the vehicle roll back until the rear of the right wheel is against the curb; when there is no curb, turn the wheels to the right to prevent the unexpected movement of the vehicle into the traffic flow.
  - Apply parking brake firmly.
  - Place automatic gear selector in "Park" position or manual gearshift in "Reverse" position.
  - Turn off ignition and remove key before leaving vehicle.
  - Vehicles, wherever possible, shall be positioned or parked so that backing the vehicle will not be necessary.
- If a vehicle must be backed, the driver shall:
  - If alone, visually check the area behind the vehicle prior to backing up or
  - If another employee is present, request he/she check the area to rear of the vehicle and act as a safety watcher or signal person during the backing operation.
When it is necessary to stop on a roadway be aware of passing vehicles and warning signals and emergency flashers shall be used.

NOISE – HEARING PROTECTION

Exposure to high noise levels can cause hearing loss or impairment. There is no cure for noise-induced hearing loss, so the prevention of excessive noise exposure is the only way to avoid hearing damage. Specifically designed protection may be required, depending on the type of noise encountered.

When employees are exposed to sound levels exceeding those in the following table, feasible engineering or administrative controls shall be utilized. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment shall be provided and used.

<table>
<thead>
<tr>
<th>Duration per day, hours</th>
<th>Sound level dBA slow response</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>1-½</td>
<td>102</td>
</tr>
<tr>
<td>1</td>
<td>105</td>
</tr>
<tr>
<td>½</td>
<td>110</td>
</tr>
<tr>
<td>¼ or less</td>
<td>115</td>
</tr>
</tbody>
</table>

*No exposure to continuous or intermittent noise in excess of 115 dBA is acceptable.

If any area appears to be excessively noisy, it should be reported to the Risk Management Office who will then perform a noise level survey to determine potential noise exposures. Hearing protection is provided in work areas or obtained by contacting the Risk Management Office.

A continuing, effective hearing conservation program shall be administered whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA, which is known as the action level. The program shall include area monitoring, notification of each employee exposed at/or above the action level, employee observation of the monitoring, audiometric testing of employees whose exposures equal or exceed the action level, a baseline audiogram for all employees within 6 months of the employee's first exposure at or above the action level, an annual audiogram for each exposed employee, and an evaluation of the audiogram with follow-up procedures. Noise dosimeter tests, instrument calibrations and audiograms shall be kept for five years.

Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that either additional employees may be exposed at or above the action level or the attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of noise reduction.
NOISE CHECKLIST

- Are there areas in the workplace where continuous noise levels exceed 85 dBA?
- Are there an ongoing preventive health programs to educate employees in safe noise levels of, exposure, effects of noise on their health and the use of personal protection?
- Have work areas, where noise levels make voice communication between employees difficult, been identified and posted?
- Are noise levels being measured using a sound level meter or an octave band analyzer and are records being kept?
- Have engineering controls been used to reduce excessive noise levels? Where engineering controls are determined not feasible, are administrative controls (i.e. work rotation) being used to minimize individual employee exposure to noise?
- Is approved hearing protective equipment (noise attenuating devices) available to every employee working in noisy areas?
- Have you tried isolating noisy machinery from the rest of your operation?
- If you use ear protectors, are employees properly fitted and instructed in their use?
- Are employees in high noise areas given periodic audiometric testing to ensure that you have an effective hearing protection system?

PERSONAL PROTECTIVE EQUIPMENT [PPE]

If removing the hazard or if engineering solutions are not feasible then personal protective equipment [PPE] may be your best defenses against personal injury. When correctly worn and used, it can reduce the amount of energy exchanged in an accident situation and prevent or reduce the degree of injury.

The company will provide you with specialized PPE where appropriate and if the hazards have been determined.

Your duty to yourself is to wear the PPE and maintain it in a good state of repair. The company requires that you use the correct PPE to protect from injuring your head, eyes, face, respiratory system, hands and feet. Use the personal protective equipment hazard assessment form to determine what is needed for a particular task. When using PPE remember the following:

- Make sure the PPE fits correctly.
- If you are required to use one, ensure you have been respirator fit-tested.
- Does the PPE offer the best protection?
- Make sure the equipment is comfortable.
- Keep the equipment clean and in a good state of repair.
- Clean the PPE before putting it away.
- Dispose or trade in any damaged item.
- Store PPE in the proper places. Avoid conditions that could damage the equipment such as, heat, light, moisture etc.
• Dispose of contaminated PPE according to the procedures.

Personal Protective Equipment is your own safety program. You are in control and only you can manage your own actions around the correct use and wearing of PPE.

Sharing of personal protective equipment is not permitted, unless a means of thoroughly sanitizing such equipment can be ensured after each use.

PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING CHECKLIST

Are employers assessing the workplace to determine if hazards that require the use of personal protective equipment (e.g. head, eye, face, hand, or foot protection) are present or are likely to be present and is this assessment documented?

If hazards or the likelihood of hazards is found, are employers selecting and having affected employees use properly fitted personal protective equipment suitable for protection from these hazards?

Has the employee been trained on PPE procedures, i.e. what PPE is necessary for a job task, when they need it, and how to properly adjust it?

Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?

Are approved safety glasses with side shields required to be worn at all times in areas where there is a risk of eye injuries such as punctures, abrasions, contusions or burns?

Are employees who need corrective lenses (glasses or contacts) in working environments having harmful exposures, required to wear only approved safety glasses, protective goggles, or use other medically approved precautionary procedures?

Are protective gloves, aprons, shields, or other means provided and required where employees could be cut or where there is reasonably anticipated exposure to corrosive liquids, chemicals, blood, or other potentially infectious materials? (See 29 CFR 1910.1030(b) for the definition of “other potentially infectious materials.”)

Are hard hats provided and worn where danger of falling objects exist?

Are hard hats inspected periodically for damage to the shell and suspension system?

Is appropriate foot protection required where there is the risk of foot injuries from hot, corrosive, poisonous substances, falling objects, and crushing or penetrating actions?

Are approved respirators provided for regular or emergency use where needed?

Is all protective equipment maintained in a sanitary condition and ready for use?

Do you have eye wash facilities and a quick Drench Shower within the work area where employees are exposed to injurious corrosive materials?

Where special equipment is needed for electrical workers, is it available?

Where food or beverages are consumed on the premises, are they consumed in areas where there is no exposure to toxic material, blood, or other potentially infectious materials?
Is protection against the effects of occupational noise exposure provided when sound levels exceed those of the OSHA noise standard?

Are adequate work procedures, protective clothing and equipment provided and used when cleaning up spilled toxic or otherwise hazardous materials or liquids?

Are there appropriate procedures in place for disposing of or decontaminating personal protective equipment contaminated with, or reasonably anticipated to be contaminated with, blood or other potentially infectious materials?

**PIPING SYSTEMS CHECKLIST**

- When non-potable water is piped through a facility, are outlets or taps posted to alert employees that it is unsafe and not to be used for drinking, washing or other personal use?

- When hazardous substances are transported through above ground piping, is each pipeline identified at points where confusion could introduce hazard to employees?

- When color painting identifies pipelines, are all visible parts of the line so identified?

- When pipelines are identified by color painted bands or tapes, are the bands or tapes located at reasonable intervals and at each outlet, valve or connection?

- When pipelines are identified by color, is the color code posted at all locations where confusion could introduce hazards to employees?

- When the contents of pipelines are identified by name or name abbreviation, is the information readily visible on the pipe near each valve or outlet?

- When pipelines carrying hazardous substances are identified by tags, are the tags constructed of durable materials, the message carried clearly and permanently distinguishable and are tags installed at each valve or outlet?

- When electricity, steam or other external source heats pipelines, are suitable warning signs or tags placed at unions, valves, or other serviceable parts of the system?

**PORTABLE LADDER CHECKLIST**

- Are all ladders maintained in good condition; joints between steps and side rails tight, all hardware and fittings securely attached, and moveable parts operating freely without binding or undue play?

- Are non-slip safety feet provided on each ladder?

- Are non-slip safety feet provided on each metal or rung ladder?

- Are ladder rungs and steps free of grease and oil?

- Is it prohibited to place a ladder in front of doors opening toward the ladder except when the door is blocked open, locked or guarded?

- Is it prohibited to place ladders on boxes, barrels, or other unstable bases to obtain additional height?
Are employees instructed to face the ladder when ascending or descending?

Are employees instructed not to use the top step of ordinary stepladders as a step?

When portable rung ladders are used to gain access to elevate platforms, roofs, etc., does the ladder always extend at least 3 feet (0.91 meters) above the elevated surface?

Is it required that when portable rung or cleat type ladders are used, the base be placed that slipping will not occur, or is it lashed or otherwise held in place?

Are portable metal ladders legibly marked with signs reading “CAUTION” – Do Not Use Around Electrical Equipment’ or equivalent wording?

Are employees prohibited from using ladders as guys, braces, skids, gin poles, or for other than their intended purposes?

Are employees instructed to only adjust extension ladders while standing at a base (not while standing on the ladder or from a position above the ladder)?

Are metal ladders inspected for damage?

Are the rungs of ladders uniformly spaced at 12 inches, (30.48 centimeters) center to center?

PORTABLE (POWER OPERATED) TOOLS AND EQUIPMENT CHECKLIST

Are grinders, saws and similar equipment provided with appropriate safety guards?

Are power tools used with the correct shield, guard, or attachment, recommended by the manufacturer?

Are portable circular saws equipped with guards above and below the base shoe?

Are circular saw guards checked to assure they are not wedged up, thus leaving the lower portion of the blade unguarded?

Are rotating or moving parts of equipment guarded to prevent physical contact?

Are all cord connected, electrically operated tools and equipment effectively grounded or of the approved double insulated type?

Are effective guards in place over belts, pulleys, chains, sprockets, on equipment such as concrete mixers, and air compressors?

Are portable fans provided with full guards or screens having openings ½ inch (1.27 centimeters) or less?

Is hoisting equipment available and used for lifting heavy objects, and are hoist ratings and characteristics appropriate for the task?

Are ground fault circuit interrupters provided on all temporary electrical 15 and 20-ampere circuits, used during periods of construction?

Are pneumatic and hydraulic hoses on power operated tools checks regularly for deterioration or damage?
Is eye and face protection used when driving hardened or tempered studs nails, and when there is a chance of debris getting into the eyes.

POWDER–ACTUATED (EXPLOSIVE) FASTENING TOOLS

Explosive actuated fastening tools shall meet ANSI requirements. Operators of these tools shall be trained and wear head and face protection.

Cartridges shall be carried and transported in approved containers.

Tools and cartridges shall never be left unattended where they would be available to unauthorized persons. Tools shall not be loaded - not even with a single load in the magazine or with a clip in place until just before starting the work; a cartridge shall not be fed into the firing chamber (ram) until just before firing.

In the event of a misfire, the tool shall be held in the operating position for at least 30 seconds, followed by an attempted re-fire, and if no response then held for another 30 seconds before removal of the cartridge in accordance with the manufacturer's instructions.

These tools shall not be used in an explosive or flammable atmosphere.

POWDER-ACTUATED TOOLS CHECKLIST

- Are employees who operate powder-actuated tools trained in their use and carry a valid operator's card?
- Is each powder-actuated tool stored in its own locked container when not being used?
- Is a sign at least 7 inches (17.78 centimeters) by 10 inches (25.40 centimeters) with bold face type reading “POWDER-ACTUATED TOOL IN USE” conspicuously posted when the tool is being used?
- Are powder-actuated tools left unloaded until they are actually ready to be used?
- Are powder-actuated tools inspected for obstructions or defects each day before use?
- Do powder-actuated tool operators have and use appropriate personal protective equipment such as hard hats, safety goggles, safety shoes and ear protectors?

POWER DISTRIBUTION SAFETY

These requirements shall be used to develop and administer a power distribution safety program to protect personnel working on facilities electric power distribution systems. Facilities managers shall have written safety rules and procedures specific to their site's operation and covering all normal activity from the utility supply point to the utilization point.
Qualified Personnel
Facilities managers shall ensure that employees involved with high voltage (over 600 volts) and low voltage (600 volts or less) are qualified. Qualifications shall be based on training, experience, aptitude, knowledge of the potential hazards, operating rules, and safeguards. Refresher training shall be provided on a regular basis.

Working Alone
Personnel working on high voltage or live low voltage power distribution systems shall never work alone. They shall be within sight or calling distance of another employee who has the following qualifications:

- Familiarity with the means of removing power from the equipment (a shut off device, lever or switch) or circuit involved.
- Familiarity with emergency measures and with emergency equipment, first aid and fire extinguisher locations.
- Ability to apply respiratory and cardiopulmonary resuscitation.

System Design
The design, installation, modification or extension of power distribution systems shall comply with the current National Electrical Code or applicable local code. In case of conflict, the most stringent requirement shall be met.

Safety Requirements – High Voltage (Over 600 Volts)
Because high voltage work requires the shut-down of electric service, there can be temptation to take "short cuts" or "calculated risks" to avoid or minimize operational delays.

There shall be no compromise between safety and operational activities regardless of the reason. All conflicts must be resolved in favor of safety. Additional requirements are:

De-Energized Equipment
Personnel shall not be allowed to work in any location where contact with energized objects is possible. Even insulated high voltage cables must be avoided. Cables which can be contacted shall be treated the same as "bare" conductors. Work on high voltage equipment shall be accomplished only after the equipment has been de-energized and properly grounded out. Covers or panels shall not be removed from any compartment in which there are exposed, energized, high voltage connections. There are three exceptions:

- Normal switching operations do not require equipment to be de-energized. (Example: Transfer of load center from one feeder to another, opening or closing sectionalizing switches, etc.)
- Grounds may be removed to permit high voltage testing. After performing high voltage DC test on cable, the cables must be grounded for a sufficient time to ensure discharge.
- Hot Stick Phasing usually requires that covers or panels be removed from equipment. Equipment shall be de-energized before panels are removed and a responsible person shall "stand guard" at the equipment while the energized connections are exposed. Equipment shall be de-energized before panels are replaced.
Safety Warning Tags
A high voltage warning tag and tagging system has been which shall be observed without exception throughout the facility. The purpose of the tag is to identify the work being done, all disconnecting devices involved, and the supervisor-in-charge authorizing placement and removal. Only the supervisor-in-charge shall remove or give permission to remove the tags. Under no circumstances shall a tag be removed before the supervisor-in-charge has verified that all personnel are clear of the work area. A tag shall never be used as a substitute lock.

Safety Equipment
The proper personal protective and safety equipment shall be used for all work on high voltage systems. Required equipment includes:

- Rubber Gloves with leather outer gloves
- Rubber Blankets
- Rubber Mats
- Safety Glasses and Face Shields
- High Dielectric Safety Helmets
- Grounding Sets
- Hot Sticks
- "Glowtectors"
- Glow lamp Testers

Storage and Care of Safety Equipment
All insulated apparel and devices shall be inspected for scratches, punctures, cracks, and/or cuts each time before use. Rubber gloves shall be air tested. Additionally, these gloves shall be tested at least annually by an approved testing laboratory. Each glove must be stamped with the date of last inspection. Rubber gloves must also be marked with their rated voltage and never used with voltages that exceed this rating. Rubber blankets shall be similarly tested and marked. All insulating equipment shall be kept in approved containers when not in use and shall be stored in a location where it is not exposed to damage or injury.

Safety Procedures – High Voltage
To ensure the maximum degree of safety for personnel working on high voltage circuits and equipment, strict operating procedures must be prepared and adhered to. Written orders are required for high voltage work. All personnel involved must be thoroughly briefed on:

- The sequence of operations for the project.
- Specific instructions for each assignment.
- The test equipment and personal protective equipment that is to be used.
- The potential hazards and the consequences of not following the procedures to the letter.

All elements of the job must be discussed regardless of the previous experience and training of personnel involved. All questions are to be resolved before the work proceeds.

Scheduled Work
All work on high voltage equipment, not of an emergency nature, shall be planned in advance. A systematic, written procedure shall be prepared by personnel designated as qualified by the facilities manager.
Emergency Work

Under emergency conditions, switching and repairs shall be limited to the minimum necessary to eliminate any exposure to personnel or property. The high voltage technician and the supervisor in charge must be in agreement before each step is taken. The supervisor in charge should have the authority to make necessary decisions in the event of an emergency. A written procedure for completing the work must then be prepared.

Switching Orders

Switching orders (procedures) shall be written to ensure that all energized circuits entering equipment, or an area in which work is to be done, shall be opened at a location remote from the work area. Each step required to take high voltage equipment out of service and to restore it to service shall be listed and followed sequentially. The switching order shall include, but not be limited to, the following requirements:

- Each disconnecting device that is opened or closed by the order shall be locked and tagged.
- All exposed terminals, buss bars and connections shall be checked with a Glowtector after the equipment has been de-energized and before grounds are applied.
- All exposed circuits shall be grounded by mean of a grounding set after the Glowtector indicates there is no potential present.
- All necessary action must be taken to ensure that the work area or equipment is isolated from back feeds from alternate power sources, emergency power supplies or electronically coupled signals.
- Personnel not involved with the work but affected by it shall be notified before power is shut off and before it is restored (computer users, other personnel, and Security.)
- Switching orders shall be reviewed and signed by the originator and/or the supervisor-in-charge and the high voltage technician.
- All tools and safety equipment required for the job shall be noted on the switching order.
- Restoration of power may be treated as a continuation of the original order, or may be a separate order. The restoration procedure shall also be described in a sequential, systematic manner, beginning with verification that all personnel involved have completed their work and have returned to a safe area. Included shall be a check for the removal of all tools, removal of grounds, performance of "high-pot" or phasing tests, securing of panels and switching operations.

Grounding Procedures

Before grounds are applied to any piece of high voltage equipment, a determination must be made that such equipment is, in fact, de-energized.

After isolating the work area by opening breakers or disconnects between the equipment and all sources of power, the Glowtector shall be checked with a glow lamp tester. The Glowtector shall then be applied to all exposed terminals and conductors in the equipment. If the Glowtector does not light up, apparently the equipment is de-energized. The Glowtector shall again be checked with the glow lamp tester to confirm that it is working properly.

After this has been done, one end of the grounding set shall be firmly clamped to the station ground bus. Using a "hot stick," the other end of the grounding set shall be touched to all exposed terminals and conductors, after which the ground clamps shall be firmly attached to all phase terminals or conductors.
Supervision
There must be a minimum of one qualified worker and one non-working supervisor (not necessarily a manager) for any job. Before the start of work, it shall be clearly established who is in charge of the work.

Safety Requirements – Low Voltage (600 Volts or Less)

In general, the same safety requirements that apply to high voltage shall also apply to low voltage work. The Facilities Manager shall ensure that employees assigned to this work have the training, competence and equipment to perform the job safely. Written procedures are required covering commonly occurring or complex tasks. Required safety and test equipment shall be listed in these procedures. Additional requirements are:

Work on Live Circuits
To the maximum extent possible, work on electrical equipment or circuits shall be done with power off. When work with a live, low voltage circuit is necessary, a systematic written procedure is required. The procedure shall highlight the precautions to be taken and the names of those authorized to do the work. When exposed circuitry is energized, only authorized personnel can be permitted in the work area. Suitable barricades and warning signs shall be used.

High Energy Circuits
Even at relatively low voltages, some circuits can supply enough amperage to release a large amount of energy under fault conditions. In addition to the inherent hazard of shock, these circuits can release energies in the form of heat, light and mechanical forces. Safety glasses must always be worn when working on live electrical circuits to protect against flying particles, sparks, molten metal and radiant energies.

Working Conditions
To ensure safe operations the following conditions shall be provided:

- All energized circuits shall be properly insulated or covered to prevent accidental contact.
- Accessibility shall be maintained to all equipment with the provision for safe working clearances.
- Electrical outlets located in humid, damp or wet places shall be equipped with ground fault current interrupters. When possible, circuits to equipment so located shall be similarly equipped.
- All equipment shall be properly grounded or double insulated. Grounding integrity checked on a regular schedule.
- Safe means for isolating equipment from power source.
- Proper tools and equipment shall be maintained in safe condition.

Control Circuits and Feedback
Frequently, circuits from more than one source are brought to equipment. Control circuits to motor starters may be supplied from a separate source and therefore remain energized when the "main" disconnect has been opened. In these cases, a secondary disconnect shall be interlocked with the main disconnect so that all power is interrupted at the same time. The equipment and the main breaker shall be labeled to show the presence of a secondary energy source.

Back feeds are sometimes experienced. Back feeds to transformers are particularly hazardous because the transformer, operating in reverse, may step up voltages to dangerous levels. Emergency and auxiliary power sources and other equipment installations must be carefully checked to prevent this condition.
Stored Energy
Common sources of stored energy are capacitors and power cables subjected to "high-pot" testing. Potential stored energy sources must be grounded out before they are worked on. Reliance cannot be placed on other devices designed to dissipate stored energies.

Miscellaneous Power
Sources Direct current and high frequency circuits may be encountered. DC circuits are particularly susceptible to arcing. High frequency circuits are particularly hazardous with respect to burns. These power sources and the equipment they serve shall be appropriately labeled.

Ground and Phase Checks
Upon completion of power distribution installations, modifications or repairs at any voltage, checks shall be made by personnel to ensure ground integrity and proper phasing.

Contractor Operations
Only qualified contractors shall be selected. They must follow these power distribution safety requirements, industry accepted safety practices and all national or state regulations. Where conflicts in these requirements exist, the most stringent will apply. Qualified personnel shall periodically inspect contractor operations to assess compliance.

Ground Fault Protection
One of the major hazards in the use of electricity occurs when, due to a fault, non-current carrying components become energized. Provisions must be made in power distribution systems and in connected equipment to protect against this hazard.

Grounding
All power distribution systems shall provide uninterrupted paths to ground potential. All electrical equipment which has exposed metal parts or covers and which operates at energy levels that could present shock hazards shall be grounded through the grounding conductors. Safety ground wire, if insulated, shall be colored green or green-yellow. See Ground Fault Circuit Interrupt Devices below for additional requirements in wet locations.

Special Grounding
Special grounding methods may be used when electrical noise on the grounding conductor interferes with voltage measurements. Special "quiet" ground grids may be provided. Ground-disabling adapter plugs may be used on power input cords after equipment grounding is achieved by the "quiet" ground circuit.

Ungrounded Equipment
If a special test must be performed with equipment not grounded, the manager or supervisor responsible for the test should ensure that all electrical power circuits are equipped with ground fault circuit interrupt devices. Each such device shall be checked for proper operation before the start of the test.

Double Insulated Equipment
Electrical equipment that is "double insulated" need not be grounded, but only when it bears the Underwriters Laboratory (UL) approval and symbol.

Ground Fault Circuit Interrupt Devices (GFCIs)
A GFCI is an electrical device that can interrupt a circuit when a differential current between the power conductors is sensed. Its sensitivity and fast response provide a high level of protection against electrical ground faults. GFCI's shall be used on power circuits serving outlets in damp, wet or outdoor locations and any other areas where personnel using electrical equipment may become well grounded. The requirement for GFCI's is in addition to the requirement for grounded or double insulated equipment (except in special tests noted above under Ungrounded Equipment).
Permanently installed GFCI's shall be tested for proper operation at least monthly. Portable GFCI's shall be tested before each use.

**Purchased Equipment**

All electrical equipment which has metal parts or covers which could be contacted and which could become energized at over 42 volts shall be double insulated or equipped with grounding type attachment cords.

Only grounding type extension cords shall be used. All plugs shall be of molded or "dead- front" type, including those used as replacement plugs. All cord and plug connected equipment and all extension cords shall be checked for proper grounding or double insulated symbol before initial use.

**Safe Work Practices**

Safe work practices must be based upon full knowledge of electrical systems, their potential hazards and the proven methods of avoiding the hazards. They are required in the installation, maintenance and use of electrical systems and in the servicing of specialized production and test equipment. Only qualified personnel shall be assigned to this work.

**Training**

Training in safe work practices is required to qualify for any electrical work assignment. Training shall include but not be limited to the following:

- Effects of electricity on the body.
- Requirements for personal protective equipment.
- Prohibition against wearing of jewelry, wristwatches and other metal objects while working on any electrical circuit.
- Use of the one hand rule.
- Restrictions on working alone.
- Requirements for lock out/tag out procedures.
- Selection and maintenance of tools and equipment.
- Selection and use of test equipment.
- Procedures for testing ground continuity.
- Use and testing of GFCI's.
- Where applicable, requirements of the power distribution safety of this section.

**Specialized Safety Training**

Employees shall be trained in special safe work practices for each new electrical assignment before starting the assignment. Potential hazards and precautions shall be stressed. On-the-job training shall then be conducted by the facility manager or by fully qualified personnel selected by the facilities manager.

Frequent on-the-job observations of work practices shall be made until the manager is satisfied the trainee observes all safety rules and is qualified for that assignment. Periodic observation and refresher training shall be provided for all qualified personnel.
Written Procedures

Written procedures are required for complex work assignments and for those requiring more than one person. Each procedure shall list the sequence of operations, key safety precautions, required personal protective equipment and approved tools and test equipment. For each assignment, a qualified person-in-charge shall be designated.

RECORDKEEPING CHECKLIST

☐ Are all occupational injury or illnesses, except minor injuries requiring only first aid, being recorded as required on the OSHA 300 log?

☐ All occupational injury or illnesses, except minor injuries requiring only first aid, must be recorded as required on the OSHA 300 log. Report them to Risk Management at 318-8211.

☐ Are employees medical records and records of employee exposure to hazardous substances or harmful physical agents up-to-date and in compliance with current OSHA standards? Employees training records are kept in employee HR files and accessible for review by employees, as required by OSHA standards.

☐ Have arrangements been made to maintain required records for the legal period for each specific type record? (Some records must be maintained for at least 40 years.) I’m not sure what this is referring to. What record are they talking about?

☐ Are operating permits and records up-to-date for such items as elevators, air pressure tanks, and liquefied petroleum gas tanks? Elevators, air pressure tanks, and liquefied nitrogen or petroleum gas tanks have operating permits and records that must be kept up-to-date.

SAFE WORK

NOAO/NSO’s management is committed to improve the safety and health of all employees. Safety standards, rules and regulations apply to all employees, contractors and visitors. Everyone shares the responsibility to work safely by following rules, procedures and standards. Everyone shares the responsibility to prevent accidents.

We are committed, and are constantly striving to provide a safe and healthy work environment for all. Safety is a value, linked with every priority and we have safety systems in place to make this a reality. You are the key to making our safety system a success and your involvement, participation and support are vital to this success. We are serious about your safety, are you?

How can you help?

Read this document, it contains valuable information, guidelines and checklists to help create a safe work environment and safe work habits. Constantly refer to it when you are uncertain about any safety issue.

If you are a new to the NOAO/NSO, we welcome you and wish you a long, happy and safe career with us. If you are a seasoned employee, we thank you for your contributions to safety and hope that the information contained in this manual will further assist you to continue being a safe employee.
Follow the safety rules and procedures at all times and if you are ever in doubt, ask. Wear your personal protective equipment, as required, all the time.

Report all injuries and property damage accidents and, most important, near misses. Investigating these events will lead to the elimination of similar occurrences.

Always practice good housekeeping habits. Remember, the foundation of a good safety program is good housekeeping, which is:

A PLACE FOR EVERYTHING AND EVERYTHING IN ITS PLACE, ALWAYS.

Encourage your fellow employees to observe safety rules and procedures.

**A SAFE WORK ENVIRONMENT**

A safe work area is where certain safety items and safety standards or rules are in order and under control. If you take control of the following items it will provide you with a safer environment, here are a few of them:

- Housekeeping
- Personal protective equipment
- Machine guarding
- Hazard communication
- Lock out, tag out, try out, for working with stored energy
- Ladders
- Electrical safety
- Hand tools
- Compressed gasses
- Cryogenic liquids
- Cranes and lifting safety
- Forklifts and motorized vehicles

**Be Aware of these Common Hazards in your Area**

- Uneven floors
- Moving machinery
- Vehicles
- Chemicals
- Electricity
- Heavy loads
- Elevated work platforms
- Confined spaces
- Fall hazards
- Fire and explosion hazards
- Noise, dusts, fumes
- Floor openings
- Damaged equipment
- Suspended loads
- Repetitive motion tasks
- Dusts containing silica or other hazardous substances

SAFETY AND HEALTH LEGISLATION AND REGULATIONS

NOAO/NSO acknowledges that both Federal and State legislation and regulations are designed to ensure that employers provide a safe and healthy workplace and that employees use the safety devices provided and follow the safety rules and procedures. In summary, SAFETY LAWS ARE FOR YOUR PROTECTION!

OSHA's [Occupational Safety and Health Act of 1970] objective can be summarized as follows:

“...to assure as far as possible every working man and woman in the nation safe and healthful working conditions, and to preserve our human resources.”

The Occupational Safety and Health Administration [OSHA], work with companies to assure a safe and healthy work environment for employees. They set safety standards and procedures for employees to follow to make the company a safer organization.

As an employee of the company, it is your responsibility to learn and follow these standards and procedures.

SAFETY AND HEALTH POLICY

Good safety practices are an integral part of the organization’s activities and are established by executive management.

NOAO/NSO is committed to providing employees and guests with a safe and healthy work environment. In pursuit of this goal, managers and supervisors are tasked with ensuring that work, conducted in their area, does not pose a potential risk to the health and well being of the assigned personnel.

Employees of NOAO/NSO also have a key role in this program by maintaining a safety conscious work attitude. Unsafe conditions or health and safety concerns should be reported to the supervisor or the NOAO/NSO Risk Management Office immediately. Employees involved in an activity that could reasonably be considered to pose a serious threat to life or health have the right, under OSHA regulations, to cease work until the condition can be reviewed and abated.

To support the Health and Safety Policy, the following are established and proven safe operating objectives:

- All accidents are preventable.
- Safety is a value associated with every priority.
- Prevention is our focus.
- Compliance without compromise to regulatory standards.
- Employee involvement is key to continuous improvement in safety performance.
• No job is so important that it will be done at the expense of your safety.
• Make safety communication a part of our daily activities.
• To create a partnership with our customers, visitors and suppliers in safety and health management.

SAFETY AND HEALTH PROGRAM CHECKLIST-Managers

☐ Do you have an active safety and health program in operation that deals with general safety and health program elements, as well as, the management of hazards specific to your worksite?

☐ Is one person clearly responsible for the overall activities of the safety and health program?

☐ Do you have a safety committee or group made up of management and labor representatives that meet regularly and report in writing on its activities?

☐ Do you have a working procedure for handling in-house employee complaints regarding safety and health?

☐ Are you keeping your employees advised of the successful effort and accomplishments you and/or your safety committee have made in assuring they will have a workplace that is safe and healthful?

☐ Have you considered incentives for employees or work groups who have excelled in reducing workplace injury or illness?

SANITIZING EQUIPMENT AND CLOTHING CHECKLIST

☐ Is personal protective clothing or equipment that employees are required to wear or use, of a type capable of being cleaned easily and disinfected?

☐ Are employees prohibited from interchanging personal protective clothing or equipment, unless it has been properly cleaned?

☐ Are machines and equipment, which process, handle or apply materials that could be injurious to employees, cleaned and/or decontaminated before being overhauled or placed in storage?

☐ Are employees prohibited from smoking or eating in any area where contaminates that could be injurious if ingested are present?

☐ When employees are required to change from street clothing into protective clothing, is a clean change room with separate storage facility for street and protective clothing provided?

☐ Are employees required to shower and wash their hair as soon as possible after a known contact has occurred with a carcinogen?

☐ When equipment, materials or other items are taken into or removed from a carcinogen-regulated area, is it done in a manner that will contaminate non-regulated areas or the external environment?

SECURITY

We are committed to a secure and harmonious work environment for employees and visitors. Security measures will be taken to facilitate such an environment. Acts of violence and/or threats of violence are not acceptable conduct in
the workplace. Firearms or other dangerous weapons are not to be brought to work areas within any NOAO/NSO facilities.

Employees may be issued a key card or key(s) to their building or work area. These are exclusively for the use of the employee and should not be loaned to others. Employees who have forgotten their card or keys and need building access during regular business hours are to contact Central Facilities Operations Department (CFO). When employees have visitors to the building, we ask that they assist us in requesting that the visitors sign in and out at the main lobby. For extended visitors temporary key cards or parking passes may be requested through Central Facilities Operations.

For our safety, and the security of our property and facilities, employees are not to let unknown persons into the building. During business hours, such persons are to be directed to the main lobby entrance. Exterior doors to the building are not to be propped open.

We maintain a service providing a security guard after regular business hours on working days, and 24 hour a day on weekends and holidays. The primary function of this service is to provide fire watch and security of Tucson facilities. Other functions include door lockup and open procedures, vehicle dispatch, escort of employees to their vehicles, response to employee reports of security related issues, and admitting approved staff and visitors to the buildings. Official visitors and contractors may not enter the facilities after hours unless authorized to do so. The security guard will request presentation of a picture I.D. while verifying authorization for after-hours entry.

Employees are responsible for their personal items brought to work. NOAO/NSO encourages and will provide reasonable means to lock up items of value such as purses, wallets, personal tools, personally owned small electronics and so forth. To arrange for keys and locks or a locking area to store personal items, please contact the risk management specialist or CFO. Employees are responsible for their personal or rented vehicles parked in NOAO/NSO parking lots. We do not recommend leaving personal vehicles in the main parking lot overnight. For employees who travel to Kitt Peak or other out-of-town, locations we provide fenced lots, which are locked after usual business hours.

Employees are asked to assist us in securing government property used in their work areas. Special tools, computers, and other government or company property may need to be locked or reasonably secured when not in use.

Company vehicles must be locked when not in use. Returned vehicles are to be parked in the maintenance yard near the facilities operations building or in the fenced lot on First Street near the warehouse. Upon arrival, the vehicles should be locked and the keys placed in the key drop box at either location.

Employees or visitors who believe unsafe or threatening conditions exist in NOAO/NSO facilities are to report these conditions to their supervisor, the Risk Management Specialist or the Human Resources Manager. All reports will be investigated and steps will be taken to resolve the situation as appropriate. Similar policies and security measures are taken at the various NOAO and NSO locations. Please check with your supervisor or the facilities staff at each location for applicable procedures.
SMOKING POLICY

We have an established smoking policy to comply with State and Federal guidelines, as well as, to encourage consideration for our non-smokers. Smoking is not permitted in company buildings in the United States. You can find this policy statement online in the Employee Handbook at:

http://www.noao.edu/cas/hr/handbook/

Smoking is not allowed in outside areas or situations where there is a chance of fire or explosion.

SPRAYING OPERATIONS CHECKLIST

- Is adequate ventilation assured before spray operations are started?
- Is mechanical ventilation provided when spraying operations are done in enclosed areas?
- When mechanical ventilation is provided during spraying operations, is it so arranged that it will not circulate the contaminated air?
- Is the spray area free of hot surfaces?
- Is the spray area at least 20 feet (6.1 meters) from flames, sparks, operating electrical motors and other ignition sources?
- Are portable lamps used to illuminate spray areas suitable for use in hazardous locations?
- Is approved respiratory equipment provided and used when appropriate during spraying operations?
- Do solvents used for cleaning have a flash point to 100 degrees F or more?
- Are fire control sprinkler heads kept clean?
- Are “NO SMOKING” signs posted in spray areas, paint rooms, paint booths and paint storage areas?
- Is the spray area kept clean of combustible residue?
- Are spray booths constructed of metal, masonry, or other substantial noncombustible material?
- Are spray booth floors and baffles noncombustible and easily cleaned (no cardboard)?
- Is infrared drying apparatus kept out of the spray area during spraying operations?
- Is the spray booth completely ventilated before using drying operations?
- Is the electric drying apparatus properly grounded?
- Are lighting fixtures for spray booths located outside of the booth and the interior lighted through sealed clear panels?
- Are the electric motors for exhaust fans placed outside booths or ducts?
- Are belts and pulleys inside the booth fully enclosed?
- Do ducts have access doors to allow cleaning?
- Do all drying spaces have adequate ventilation?

STACKING AND STORAGE
To maintain good housekeeping practices, good stacking and storage of materials, goods and supplies is essential. Follow these basic stacking rules and apply them all the time.

- Ensure that all stacks are bonded. Interlocked, tied in, intertwined.
- Always stack heavy items on the bottom.
- Use proper storage racks where possible.
- Check the load rating of the floor before stacking on it.
- Always break down a stack from the top; never take items from the bottom.
- Get help if the items are heavy or if you are unsure.
- Never climb up on a stack or on stacked material. Use proper access.
- Leaning or unstable stacks must be broken down and safely rebuilt.
- Never stack higher than 3 times the length of the narrowest base.
- Allow access for fork trucks and foot traffic if necessary.
- Stack within demarcated stacking areas.
- Do not stack heavy items on top of cabinets that have the risk of falling off and injuring someone. Stacking within cabinets must be neat and tidy.
- Are all storage racks securely fastened so they will not fall?
- Use correct access to storage racks.
- Do not allow pipes or lengths of material to protrude from storage racks.

STAIRS AND STAIRWAYS CHECKLIST

- Are standard stair rails or handrails on all stairways having four or more risers?
- Are all stairways at least 22 inches (55.88 centimeters) wide?
- Do stairs have landing platforms not less than 30 inches (76.20 centimeters) in the direction of travel and extend 22 inches (55.88 centimeters) in width at every 12 feet (3.66 meters) or less of vertical rise?
- Do stairs angle no more than 50 and no less than 30 degrees?
- Do stairs of hollow-pan type treads and landings fill to the top edge of pan with solid material?
- Are step risers on stairs uniform from top to bottom?
- Are steps on stairs and stairways designed or provided with a surface that renders them slip resistant?

TIRE INFLATION CHECKLIST

- Is there a safe practice procedure posted and enforced, where tires are mounted and/or inflated on drop center wheels?
- Is there a safe practice procedure posted and enforced, where tires are mounted and/or inflated on wheels with split rims and/or retainer rings?
- Does each tire inflation hose have a clip on chuck with at least 24 inches (6.9 centimeters) of hose between the chuck and an inline hand valve and gauge?
Does the tire inflation control valve automatically shut off the airflow when the valve is released?

Is a tire-restraining device such as a cage, rack or other effective means used while inflating tires mounted on split rims, or rims using retainer rings?

Are employees strictly forbidden from taking a position directly over or in front of a tire while it is being inflated?

Has documented tire mounting/inflation training been provided?

**TIRE SERVICE**

- Always evaluate your workplace for hazards before working.
- Never depend on hydraulics only to support elevated vehicles, supplement with blocks or jacks with locking pins or mechanical shoes.
- Always deflate tires completely before de-mounting from the rim.
- Never put yourself under the tire when the tire is suspended or elevated.
- Always inspect and replace damaged rim and wheel parts.
- Always use a tire cage, chains, cable, or barrier before primary inflation.
- When filling a tire, stand clear of the tire and do not place body parts between fenders or cages.
- Never weld or apply heat to wheel-rim components.
- Never hammer on inflated tires.
- On larger tire assemblies, do not remove lug nuts until wedges are released from pressure.
- Always wear your safety glasses and hearing protection when servicing tires.
- Never ever service “widow maker” rims.
- When checking rim assemblies, watch for burrs or cracks as they can cut.
- Never use ether or similar products to seat tire beads.
- Do not mismatch, under any circumstances, rim or wheel components.
- Use non-flammable vegetable lube for beads and lugs.
- Ensure that there is no debris inside the tire before mounting.
- Stay clear from the “explosion trajectory” when servicing tires.
- Inline air gauges should be used and stand away from the tire while inflating.
- When working under vehicles, safety jacks or stands must be used after the vehicle has been raised to working height.
- All machinery will be shut down before repairs are made.

**TRANSPORTING EMPLOYEES AND MATERIALS CHECKLIST**

- Do employees who operate vehicles on public thoroughfares have a valid operator’s license?
- When seven or more employees are regularly transported in a van, bus or truck is the operator’s license appropriate for the class of vehicle being driven?
- Is each van, bus or truck used regularly to transport employees equipped with an adequate number of seats?
- When employees are transported by truck, are provisions provided to prevent their falling from the vehicle?
Are vehicles used to transport employees equipped with lights, brakes, horns, mirrors, windshield and turn signals, and are they in good repair?

Are transport vehicles provided with handrails, steps, stirrups or similar devices so placed and arranged that employees can safely mount or dismount?

Are employee transport vehicles equipped at all times with at least two reflective type flares?

Is a full charged fire extinguisher, in good condition, with at least A:B:C rating maintained in each employee transport vehicle?

When cutting tools or tools with sharp edges are carried in passenger compartments or employee transport vehicles, are they placed in closed boxes or containers that are secured in place?

Are employees prohibited from riding on top of any load that can shift, topple or otherwise become unstable?

**VENTILATION**

Airborne contaminants in workplaces may be controlled by either of two basic mechanical ventilation methods: (1) dilution, often called general ventilation, or (2) local exhaust ventilation. A third method - high-velocity, low-volume ventilation - is a special application of local exhaust ventilation that removes contaminants at their source.

When choosing a mechanical ventilation system, consider a number of factors, including toxicity of the contaminants, the nature of the source, quantity, the rate of evolution of contaminants from the source, climatic conditions at the workplace, and applicable federal, state and local government standards and codes.

General mechanical (dilution) ventilation usually is not as effective as local exhaust ventilation in controlling levels of toxic airborne chemicals. In some cases, however, general ventilation is suitable. The advantages and disadvantages of each system are described below.

**Dilution Ventilation**

**Advantages:**
- Low initial installation cost.
- Appropriate for several small sources generating uniform volumes of airborne contamination.
- Can ventilate many processes at the same time.
- Removes widely dispersed heat and humidity.
- Can be physically located to enhance heat rise or removal of hot process gases.
- Easy maintenance.

**Disadvantages:**
- Adequate only for low-toxicity contaminants.
- Employees must be kept out of the contaminant airflow pattern.
- Works only if the contaminant is generated at a uniform rate.
- Requires more make-up air (additional air volume).
- Will not work effectively against high resistance.
- Is not very effective in controlling airborne dusts.
Local Exhaust Ventilation

Advantages:

- Properly designed and maintained systems can handle any concentration of contaminants.
- System’s effectiveness not reduced by employees working nearby.
- Effectively prevents escape of contaminants into work areas.
- Improves housekeeping.
- Eliminates toxicity factor.
- Requires relatively low air volumes.
- Minimizes cost associated with treatment of contaminated air before discharge into community environment.

Disadvantages:

- Requires detailed maintenance and operational effectiveness evaluations.
- High initial costs.
- Local exhausts will not appreciably reduce contaminant levels from adjacent operations.
- Does not adapt readily to transient operations.
- Cross-drafts affect the ability of some systems to capture contaminants.

WALKWAY CHECKLIST

- Are aisles and passageways kept clear?
- Are aisles and walkways marked as appropriate?
- Are wet surfaces covered with non-slip materials?
- Are holes in the floor, sidewalk or other walking surface repaired properly, covered or otherwise made safe? Is there safe clearance for walking in aisles where motorized or mechanical handling equipment is operating?
- Are materials or equipment stored in such a way that sharp projections will not interfere with the walkway?
- Are spilled materials cleaned up immediately?
- Are changes of direction or elevations readily identifiable?
- Are aisles or walkways that pass near moving or operating machinery, welding operations or similar operations arranged so employees will not be subjected to potential hazards?
- Is adequate headroom provided for the entire length of any aisle or walkways?
- Are standard guardrails provided wherever aisle or walkway surfaces are elevated more than 30 inches (76.20 centimeters) above any adjacent floor or the ground?
- Are bridges provided over conveyors and similar hazards?

WALKWAYS, ELEVATED SURFACES, FLOOR AND WALL OPENINGS, STAIRS AND STAIRWAYS

Working surfaces are one of the most common sources of accidents. It is important that all employees involved in the use of walkways, elevated surfaces, floor and wall openings, stairs and stairways understand the risks involved. Use the following checklists to ensure that the equipment meets minimum standards and that the rules are followed.
WELDING, CUTTING AND BRAZING

The safe and successful completion of any welding and/or cutting operation is dependent upon a knowledge and understanding of the processes and principles involved and the hazards present, along with the controls that are available.

Some hazards include flashback, regulator burnout, intense light, sparks, potential explosive combinations and others. The following give basic guidelines to prevent such problems.

Eye Protection

All persons in the immediate area of a welding operation shall wear eye protection such as goggles or shields. Welders and their helpers should wear filter glasses to protect their eyes against infrared and ultraviolet light. The guide below shows shade numbers of filter lenses recommended for various kinds of welding. Denser shades may be selected to suit a welder's needs.

<table>
<thead>
<tr>
<th>Welding Operation</th>
<th>Shade No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering</td>
<td>2</td>
</tr>
<tr>
<td>Torch brazing</td>
<td>3 or 4</td>
</tr>
<tr>
<td>Light cutting, up to 1 inch</td>
<td>3 or 4</td>
</tr>
<tr>
<td>Medium cutting, 1 inch to 6 inches</td>
<td>4 or 5</td>
</tr>
<tr>
<td>Gas welding (light) up to 1/8 inch</td>
<td>4 or 5</td>
</tr>
<tr>
<td>Heavy cutting, 6 inches and over</td>
<td>5 or 6</td>
</tr>
<tr>
<td>Gas welding (medium) 1/8 inch to 1/2 inch</td>
<td>5 or 6</td>
</tr>
<tr>
<td>Gas welding (heavy) 1/2 inch and over</td>
<td>6, 7 or 8</td>
</tr>
<tr>
<td>Shielded metal-arc welding 1/16, 3/32, 1/8, 5/32 inch electrodes</td>
<td>10</td>
</tr>
<tr>
<td>Atomic Hydrogen welding</td>
<td>10-14</td>
</tr>
<tr>
<td>Gas-shielded arc welding (nonferrous) 1/16-, 3/32-, 1/8-, 5/32-inch electrodes</td>
<td>11</td>
</tr>
<tr>
<td>Gas-shielded arc welding (ferrous) 1/16-, 3/32-, 1/8-inch electrodes</td>
<td>12</td>
</tr>
<tr>
<td>Shielded metal-arc welding 3/16-, 7/32-, 1/4-inch electrodes</td>
<td>12</td>
</tr>
<tr>
<td>5/16-, 3/8-inch electrodes</td>
<td>14</td>
</tr>
<tr>
<td>Carbon Arc welding</td>
<td>14</td>
</tr>
</tbody>
</table>

NOTE: In gas welding or oxygen putting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation. The table is from OSHA 29 CFR, part 1910.252.

Welding operations should be enclosed wherever possible with suitable curtains or portable screens to prevent people from accidentally exposing themselves to the intense radiation. Unless a welding arc is behind a screen or barrier, not only the welder but also people nearby may need eye protection. Workers more than 30 feet from gas or low-power arc welding should be safe without tinted lenses.
People should be at least 100 feet from heavy arc welding to be safe from ultraviolet light. Inert gas welding may produce 5 to 30 times as much ultraviolet light as ordinary arc welding, and requires shielding from the sight of unprotected workers great distances away. Untreated plastic lenses poorly absorb ultraviolet light and should not be used while welding.

**Clothing**

All parts of the body should be protected from radiant energy, sparks, and molten metal particles. Clothing made of wool or wool blends is generally better than cotton. Woolen clothing is preferable to cotton because it is not so readily ignited and helps protect the welder from changes in temperature. Cotton clothing should be chemically treated to reduce its combustibility. Other clothing such as jumpers or overalls should be reasonably free from oil and grease.

Some welding processes such as inert gas metal arc welding will cause exposed cotton clothing to deteriorate rapidly. Leather capes, jackets, leggings and aprons will provide additional protection, especially when welding in vertical or overhead positions. The use of dark clothing will reduce the amount of reflected light. Never use oxygen to blow dust off clothing. Oxygen may cling to porous cloth and enhance the risk of igniting the cloth. Clothing should be constructed to minimize pockets, cuffs, etc., which will act to catch hot slag or sparks.

**Respiratory Protection**

Virtually all welding processes generate gases, fumes and dusts. Gases created by electric arc welding include carbon monoxide, ozone and nitrous gases. Other gases are formed in the presence of other chemicals, which may be on the material being welded. 1,1,1 Trichloroethane, for instance, generates phosgene gas when exposed to the heat or ultraviolet light of welding.

Gas cutting and welding generates carbon monoxide, carbon dioxide and nitrous gases. Cadmium, lead, zinc, beryllium, arsenic, fluorides, nickel, cyanide and other materials can also be present in the welder’s breathing zone. Appropriate respiratory protection should always be used. This protection can be determined by consulting the Material Safety Data Sheet for the material being welded, the welding rods being used, or the flux required.

**Ventilation for General Welding and Cutting**

Mechanical ventilation shall be provided when welding or cutting is done on metals when any of the three conditions outlined below are not met. Special requirements apply to the following: fluorine compounds, zinc, lead, beryllium, cadmium, and mercury. Mechanical ventilation shall also be provided for cleaning compounds because of their toxicity or flammability and stainless steel that is being oxygen-cut using either a chemical flux or iron powder or gas-shielded arc cutting. This ventilation shall be provided:

1. In a space of less than 10,000 cubic feet per welder.
2. In a room having a ceiling height of less than 16 feet.
3. In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation. Confined space procedures shall be followed.

Such ventilation shall be at the minimum rate of 2,000 cubic feet per minute per welder, except where local exhaust hoods and booths or airline respirators are provided. Natural ventilation is considered sufficient for welding or cutting operations where the above restrictions are not present.
Local Exhaust Hoods and Booths

Mechanical local exhaust ventilation may be by means of either of the following:

1. **Hoods.** Freely moveable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of airflow sufficient to maintain a velocity in the direction of the hood of 100 linear feet per minute in the welding zone when the hood is at its most remote distance from the point of welding.

2. **Fixed enclosure.** A fixed enclosure with a top and not less than two sides that surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet per minute.

Arc Welding

The best protection against electric shock is to keep the welder's body insulated from the work, electrode and holder. Clothing and equipment should be dry and the equipment should be in good condition and properly grounded. There should not be any repairs or splices within ten feet of the electrode holder. Welding cables should not be draped or otherwise attached to any part of the welder's body.

Equipment

All welding equipment should be inspected daily prior to use. Qualified personnel should make repairs to electrical arc welder components, compressed gas regulators and torches only.

Compressed Gases and Gas Welding Tips:

- Compressed gas cylinders should always be stored in an upright position and secured sufficiently to prevent the cylinders from falling over or onto one another. Cylinders containing oxygen or fuel gases should be stored in well-ventilated areas and should not be taken into areas that qualify as "confined spaces."
- Empty cylinders should be marked "empty" or "MT" and should continue to be treated as full cylinders.
- All compressed gas cylinders should be properly identified as to their contents. Any cylinders that do not have labels that identify the contents (type of gas), or the UN number and appropriate hazard identification warnings, should not be accepted from the distributor or used. Do not rely on the cylinder color to identify the contents and do not "sniff test" a cylinder to determine the contents.
- Reverse flow check valves should be used to prevent the forming of explosive mixtures of oxygen and fuel gases. Reverse flow check valves should be installed between the hose and the torch inlet. Flashback arresters should be used to help prevent flashbacks from damaging gauges, rupturing regulator diaphragms or causing cylinder damage or failure.
- Oxy-acetylene cylinders should never be transported without first removing the regulators and replacing the cylinder caps. Do not leave pressure on regulators that are not being used. The cylinder should be shut off and regulator screws should be backed out completely.
- Grease or oil should never be exposed to regulators, torches, hoses or cylinders of oxygen or acetylene.
- Acetylene is an unstable compound of hydrogen and carbon. Regardless of the capacity of the regulator gauge, acetylene should never be withdrawn from a cylinder at more than 15 psig. Acetylene can explode by itself at 1435 degrees F or at 30 psig. A mixture of 3% acetylene and 97% air is a potential bomb.
- Acetylene is stored in cylinders containing a porous material and liquid acetone. The acetylene gas collects in a small space at the top of the cylinder. If cylinders are not used in the upright position or are used at
demands higher than 42 cubic feet per hour, acetone will leak out and will dissolve rubber hoses, dia-
phragms, seals, etc. and create a potentially explosive condition.

- Hoses should be inspected regularly and repairs should be made using an original equipment manufacturer-
type splice. Tape should not be used for hose repairs.
- Cylinder valves should be blown out before connecting the regulator. This can be done by "cracking" the
cylinder valve briefly. Make sure that the valve is pointed away from you and towards a safe area.
- Do not use cylinder valve protection caps for lifting.
- Never use unalloyed copper piping for piping acetylene gas. Highly explosive acetylides are formed which
are easily detonated.
- To insure safety and accuracy on pressure gauges, have them tested periodically.
- Always refer to acetylene as "acetylene," oxygen, as "oxygen," and so on. Using the word "gas" is too
generic and can cause confusion and create potentially dangerous situations. Oxygen should not be
referred to as "air" or be used as such to operate tools, blow dust, etc.
- Never connect a regulator to a cylinder containing a gas other than that for which the regulator was
designed.
- Acetylene cylinder valves should never be opened more than 1 1/4 turns. If a wrench or "key" is required, it
must be left on the valve so that the cylinder can be shut off in an emergency. Oxygen cylinder valves
should be opened completely. These are high-pressure valves with seats that are designed to seat around
the stem and prevent leakage.
- Always shut off the acetylene first, then the oxygen. This extinguishes the flame and eliminates the
possibility of leaving a small flame in the top or creating a flash back.

Fire Prevention - Hot Work Permit

Generally, outside of designated shops, cutting and welding is permitted only when the area has been made fire safe
or free from combustible and flammable materials. All movable fire hazards in the area must be relocated, when fire
hazards cannot be moved, special safeguards shall be considered. Fire extinguishers shall be made available on
site. Conditions may require a "fire watch."

Any hot work involving cutting and welding outside a designated shop must be approved and inspected by the
Supervisor before execution. A Hot Work Permit shall be completed before the work begins.

WELDING, CUTTING AND BRAZING CHECKLIST

- Are only authorized and trained personnel permitted to use welding, cutting or brazing equipment?
- Does each operator have a copy of the appropriate operating instructions and are they directed to follow them?
- Are compressed gas cylinders regularly examined for obvious signs of defects, deep rusting, or leakage?
- Is care used handling and storing cylinders, safety valves, and relief valves to prevent damage?
- Are precautions taken to prevent the mixture of air or oxygen with flammable gasses, except at a burner or in a
  standard torch?
- Are only approved apparatus (torches, regulators, pressure reducing valves, acetylene generators, manifolds) used?
Are cylinders kept away from sources of heat?

Are the cylinders kept away from elevators, stairs, or gangways?

Is it prohibited to use cylinders as rollers or supports?

Are empty cylinders appropriately marked and their valves closed?

Are signs reading: DANGER – NO SMOKING, MATCHES, OR OPEN FLAMES, or the equivalent, posted?

Are cylinders, cylinder valves, couplings, regulators, hoses, and apparatus kept free of oily or greasy substances?

Is care taken not to drop or strike cylinders?

Unless secured on special trucks, are regulators removed and valve-protection caps put in place before moving cylinders?

Do cylinders without fixed hand wheels have keys, handles, or non-adjustable wrenches on stem valves when in service?

Are liquefied gases stored and shipped valve-end up with valve covers in place?

Are provisions made to never crack a fuel gas cylinder valve near sources of ignition?

Before a regulator is removed, is the valve closed and gas released from the regulator?

Is red used to identify the acetylene (and other fuel, gas) hose, green for oxygen hose, and black for inert gas and air hose?

Are pressure-reducing regulators used only for the gas and pressures for which they are intended?

Is open circuit (No Load) voltage of arc welding and cutting machines as low as possible and not in excess of the recommended limits?

Under wet conditions, are automatic controls for reducing no load voltage used?

Is grounding of the machine frame and safety ground connections of portable machines checked periodically?

Are electrodes removed from the holders when not in use?

Is it required that electric power to the welder be shut off when no one is in attendance?

Is suitable fire extinguishing equipment available for immediate use?

Is the welder forbidden to coil or loop welding electrode cable around his body?

Are wet machines thoroughly dried and tested before being used?

Are electrode lead cables frequently inspected for wear and damage, and replaced when needed?

Do means for connecting cable lengths have adequate insulation?

When the object to be welded cannot be moved and fire hazards cannot be removed, are shields used to confine heat, sparks and slag?

Are firewatchers assigned when welding or cutting is performed in locations where a serious fire might develop?

Are combustible floors kept wet, covered by damp sand, or protected by fire-resistant shields?
When floors are wet down, are personnel protected from possible electrical shock or slipping?

When welding is done on metal walls, are precautions taken to protect combustibles on the other side?

Before hot work is begun, are used drums, barrels, tanks, and other containers so thoroughly cleaned that no substances remain that could explode, ignite, or produce toxic vapors?

Is it required that eye protection helmets, hand shields and goggles meet appropriate standards?

Are employees exposed to the hazards created by welding, cutting, or brazing operations protected with personal protective equipment and clothing?

Is a check made for adequate ventilation in and where welding or cutting is performed?

When working in confined places, are environmental monitoring tests taken and means provided for quick removal of welders in case of an emergency?