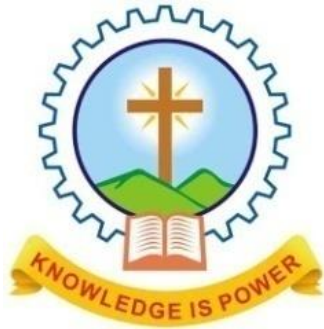




MAR ATHANASIOUS COLLEGE OF ENGINEERING

HEALTH, SAFETY & ENVIRONMENT



VISION

EXCELLENCE IN EDUCATION THROUGH RESOURCE INTEGRATION

MISSION

THE INSTITUTION IS COMMITTED TO TRANSFORM ITSELF INTO A CENTRE OF EXCELLENCE IN EDUCATION, UPHOLDING THE MOTTO “KNOWLEDGE IS POWER”. THIS IS TO BE ACHIEVED BY IMPARTING QUALITY EDUCATION TO MOULD TECHNICALLY COMPETENT PROFESSIONALS WITH MORAL INTEGRITY, ETHICAL VALUES AND SOCIAL COMMITMENT AND BY PROMOTING INNOVATIVE ACTIVITIES IN THE THRUST AREAS EMERGING FROM TIME TO TIME.

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EMERGENCY CONTACT NUMBERS

Emergency Contact	Phone Number
Safety Co-ordinator	9048995510
Fire Station, Kothamangalam	0485 2822420
Ambulance	9446806460, 9846019344
Police Station, Kothamangalam	0485 2862328
College Office	0485 2822363
HOD Civil Engineering	9446219301
HOD Mechanical Engineering	9447500357
HOD Electrical and Electronics	9746250297
HOD Electronics & Communication	9447457933
HOD Computer Science	9447871768
HOD Computer Applications	9446222090
HOD Science Department	9388865401
Physical Education Faculty	9447870761
MBMM Hospital, Kothamangalam	0485 2822203
St. Joseph's Hospital, Kothamangalam	0485 2862391
Govt. Hospital, Kothamangalam	0485 2822603

1.0 Introduction to the Occupational Safety Manual

1.1 Purpose

1.2 Scope

1.3 Development, Maintenance, and Revision Process

It is the policy of the Mar Athanasius College of Engineering, Kothamangalam to provide a safe and healthy working and learning environment for all students, faculty, employees, visitors, and contract employees.

This manual has been prepared by **HSE Committee** in an effort to prevent injuries, illnesses, and death from work, calamity and accident related causes and to minimize losses of material resources and interruptions from above mentioned occurrences. It is directed toward the control of all types of hazards encountered in the performance of duties of all students and staff.

1.1 Purpose

The purpose of the MACE Occupational Safety Manual is to provide students and employees with general guidelines for implementing a high quality safety program. It is not an exhaustive source document but rather an approach to safety.

The manual brings together information that will assist students and employees to carry out their responsibility in ensuring a safe environment at MACE.

All personnel should become familiar with the information contained in this manual and should conduct their operations accordingly.

1.2 Scope

The information and requirements given in this manual are applicable to all areas of the college and represent only general minimum standards. They do not substitute for special operation manuals used in certain buildings or laboratories to meet specific situations. This manual will serve as a basis to which supervisors shall add safety measures relevant to their laboratory or work areas.

It must be emphasized that this is primarily an in-house manual. The procedures and requirements are established based on the facilities and resources available. They represent, nonetheless, a code of standard safe work practices.

This manual contains the objectives, policies, standards, and procedures that pertain to all employees. Specific responsibilities, administrative procedures, and operational requirements are described that are relevant to institutional work, and the prevention of occupational injuries and illnesses.

1.3 Development, Maintenance, and Revision Process

All materials in this manual have been developed and maintained under the supervision of HSE Committee. The HSE Committee has provided guidance for all policy issuances in this manual.

Additional material for inclusion in the safety manual should be submitted to the HSE Committee. HSE Committee will then submit it to the College Council for consideration.

2.0 Occupational Safety Program Management

2.1 Goal

2.2 Policy

2.3 Program Elements

2.4 Response to Non-Compliance

2.5 Assignment of Responsibility

2.6 Safety Council

2.1 Goal

MACE will provide and promote a safe and healthful working and learning environment and will foster a positive safety and health attitude in employees, students and others (including visitors and contractors).

2.2 Policy

It is the policy of MACE to develop and maintain a current, model occupational safety, health, and environmental program. The model program will focus on prevention of, and protection against, injuries and illness, and the promotion of safe and healthful actions and attitudes.

2.3 Program Elements

The following program elements are applicable to all operations and activities. These elements are directed towards the prevention of accidents and health hazards present in the performance of duties of all students and staff of MACE.

A. Prevention

HSE Committee will emphasize strategies that preclude or prevent any occurrence that would have an adverse effect on the faculty, students, staff, contractors, visitors, and people in the neighbouring community.

B. Surveillance

HSE Committee will provide for the systematic inspection of facilities, the collection, analysis, interpretation, and evaluation of safety and health data essential to the planning and implementation of the program.

C. Protection and Control

A system for the control of hazards will be maintained and will include, engineering controls, the use of alternatives that are less hazardous, administrative procedures, and the use of personal protective equipment.

D. Emergency Preparedness and Response

The HSE Committee process will seek to identify circumstances, which require advance preparation and immediate action. The Emergency Situation Response Plan (ESRP) has been developed and maintains contingency plans and procedures to address these circumstances, and communicate (to those potentially affected and to those who must respond) plans of action for responding to fire, medical, first aid, radiation, adverse weather and other incidents that may require advance preparation and timely response.

E. Education, Promotion, and Training

Health and safety awareness will be promoted among employees, students and contractors through orientation programs and regularly scheduled safety education and training sessions, as appropriate.

F. Notification and Communication

Students, employees and others (visitors, contractors) will be notified of their exposure, or potential exposure, to hazardous substances or conditions by HSE Committee and will be informed of risks that result, or may result, from exposure to hazardous substances or conditions.

G. Program Evaluation

An annual evaluation of the overall program will be conducted by HSE Committee to determine if the program if its policies and procedures are relevant and appropriate, and if they continue to meet or exceed health and safety standards.

2.4 Response to Non-Compliance

In an ongoing commitment to assure safe and healthful workplace, conditions are provided to faculty, students, employees, contractors and visitors HSE Committee conducts routine facility compliance surveys. The following procedures are used by the HSE Committee to ensure compliance with MACE policies and applicable laws and regulations.

Verbal Notification:

If during a routine evaluation or inspection, a safety hazard is observed, a verbal recommendation will be provided. If the condition is determined to be one of imminent danger, the operation will be halted and HSE Committee will provide a recommendation for how to conduct the operation safely.

Step One:

Following the evaluation/inspection a written summary of the findings and recommendations, including corrections during the survey, will be sent to the person responsible for the area. The person in charge of the area will be required to take correction action within 30 days.

Step Two:

After 30 days, if a second observation reveals that the same discrepancy exists, notification of this situation will be sent to both the person in charge of the area and the Safety Co-ordinator. A written response, including specific steps taken to ensure correction of the discrepancy, will be sent to HSE Department.

Step Three:

If the hazard continues, both the person in charge of the area and Safety Co-ordinator will be given a written account of the situation. The entire case history of the event will also be presented to the Safety Council and submitted to the College Administration.

2.5 Assignment of Responsibility**A. Safety Co-ordinator**

The Safety Co-ordinator is responsible for:

- Identifying the applicable standards, guidelines, and recommendations necessary for a safe and healthful work place;
- Establishing and annually reviewing policy and procedure manuals;
- Providing, training and education to all staff and students;
- Providing consultation for safety and health emergencies;
- Maintaining comprehensive records of hazards at the operational level and sharing this information with the College Council;
- Requesting program reviews and audits for methods of continuous improvement.

B. Students

Students at all levels throughout the college are responsible for:

- Complying with all health and safety standards, rules, regulations, and orders issued by EH&S;
- Promptly informing concerned faculty/staff advisor/HSE Committee regarding all work related incidents resulting in personal injury, illness and/or property damage;
- Promptly reporting to their supervisors any unsafe or unhealthy conditions in the work environment;
- Taking all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

C. Faculty

Faculty at all levels throughout the college are responsible for maintaining a safe and healthful workplace by:

- Complying with all applicable safety and health standards, rules, and regulations pertaining to the activities immediately under their jurisdiction;
- Ensuring that employees are instructed and/or trained in safe practices and methods of job performance pertaining to their assignments;
- Ensuring that sick and/or injured employees performing official duties receive appropriate first aid and/or medical attention;
- Investigating and reporting each incident and/or injury; conducting regular surveys of their operations to ensure compliance with safety standards, codes, regulations, rules and orders applicable to the work area concerned; ensuring that staff/students under their supervision are aware of their responsibilities.

D. Other Staff

Other staffs at all levels throughout the college are responsible for:

- Complying with all health and safety standards, rules, regulations, and orders issued by EH&S;
- Promptly advising their supervisor regarding all work related incidents resulting in personal injury, illness and/or property damage;
- Promptly reporting to their supervisors any unsafe or unhealthy conditions in the work environment;
- Taking all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

2.6 HSE Committee

A. Charge

The HSE Committee reports to the College Council to provide guidance and recommendations on safety, health and security matters. The council's charge is to:

- Identify safety needs for the institution and develop plans to implement activities that ensure that those needs are met.
- Prescribe the collection of appropriate indicator data to measure outcomes of various MACE safety efforts.
- Discuss and resolve issues where gaps in safety or emergency preparedness may arise or persist.
- Provide reports, advice and recommendations to the Board of Governors for consideration and action.

B. Membership

Members of the committee include Safety Co-ordinator, one faculty member from each department, one member from Ministerial Staff, one member from Technical staff from each department and two students (a boy and a girl) from each year, NSS programme officer, and Sergeant.

3.0 General Health and Safety

- 3.1 Prevention and Control of Workplace Hazards
- 3.2 Hazard Reporting
- 3.3 Personal Protective Equipment
- 3.4 Hazard Communication
- 3.5 Noise
- 3.6 Housekeeping
- 3.7 Electric Work Permits

3.1 Prevention and Control of Workplace Hazards

It is the goal of MACE to comply with all applicable regulations to provide the students, faculty, employees and visitors with a safe and healthful working and learning environment. All recognized safety and health hazards shall be eliminated or controlled as quickly as possible, based upon the degree of risk posed by the hazards.

A. Principles of Hazard Control

Engineering Controls

Substitution. The risk of injury or illness may be reduced by replacement of an existing process, material, or equipment with a similar item having more limited hazard potential. Care must be exercised in any substitution to ensure that the substitute materials are technically acceptable and to avoid introducing new or unforeseen hazards.

Isolation. Hazards are controlled by isolation whenever an appropriate barrier is placed between the hazard and an individual who may be affected by the hazard. This isolation can be in the form of physical barriers, time separation, or distance. Examples include machine guards, electrical insulation, glove boxes, acoustical containment, and remote controlled equipment.

Ventilation. The control of a potentially hazardous airborne substance by ventilation can be accomplished by one or two methods: using local exhaust by capturing and removing the substance at its source, or if that is not feasible, diluting the concentration of the substance by mixing with uncontaminated.

Administrative Controls

This method of hazard mitigation depends on effective operating practices that reduce the exposure of individuals to chemical or physical hazards. These practices may take the form of limited access to high hazard areas, preventive maintenance programs to reduce the potential for leakage of hazardous substances, or adjusted work schedules, which involve a regimen of work in high hazard and low hazard areas.

A. Personal Protective Equipment. (PPE)

This method of hazard control is least preferred because personal protective devices may reduce a person's productivity, while affording less effective protection against the recognized hazard than other methods of control. Nevertheless, there are instances where adequate levels of risk reduction cannot be achieved through other methods, and personal protective devices must be used, either alone or in conjunction with other protective measures.

B. Application of Hazard Control Principles

Hazardous conditions in the workplace may be prevented through appropriate actions when facilities are designed, when operating procedures are developed, and when equipment is purchased.

1. *Design Reviews.* Occupational health and safety issues shall be considered, designed, and engineered into all facilities, which are acquired or constructed. To ensure that appropriate hazard control techniques are applied, EH&S shall participate in the review of plans and specifications for construction and renovation projects.
2. *Operating Procedures.* Standard operating procedures or similar directives developed by the supervisor that are issued to direct the manner in which work is performed shall include appropriate health and safety requirements.
3. *Purchasing Procedures.* Many hazards can be avoided by incorporating appropriate specifications for purchased equipment/material and contracted efforts that involve work at MACE facilities. Departments/Personnel responsible for developing specifications for such purchases should coordinate with safety personnel to ensure that health and safety requirements are considered.
4. *Permanent Hazard Abatement.* Engineering control methods are the preferred method of hazard control, followed by administrative control and personal protective equipment.

3.2 Hazard Reporting

Identification and reporting of potentially unsafe or un-healthful working conditions is the responsibility of all MACE students and employees. All employees are encouraged to report unsafe or un-healthful working conditions to EH&S or to their immediate supervisor who will promptly investigate the situation and take appropriate corrective actions.

Any physical hazard or unsafe act by an employee or contractor should be reported immediately by contacting HSE Committee Members (Phone Numbers provided at the beginning of this manual). A report will be generated and a safety representative will respond to the report to investigate.

3.3 Personal Protective Equipment (PPE)

When engineering or administrative controls are not practical or applicable, personal protective equipment shall be employed to reduce or eliminate personnel exposure to hazards.

Personal protective equipment (PPE) will be provided, used, and maintained when it has been determined that its use is required and that such use will lessen the likelihood of occupational injuries and/or illnesses.

HSE Committee will recommend and/or provide necessary protective equipment where there is a reasonable probability that the use of the equipment will prevent or reduce the severity of injuries or illness.

3.4 Hazard Communication

MACE Staff/Students may perform a wide range of operations and provide services that commonly require the use of chemicals that have inherent chemical and physical hazards. General office activities may also involve working with products that contain regulated chemicals.

The standard requires the college to provide information to their employees concerning the hazardous chemicals in the workplace through a written program, training session; materials safety data sheets (MSDS), labels and warnings, and other pertinent information (as the case may be, if applicable).

3.5 Noise

Evidence is well established that prolonged exposure to noise of sufficient intensity and duration can result in hearing damage. Noise-induced hearing loss rarely results from just one exposure; it can progress unnoticed over a period of years. Initial noise-induced hearing loss occurs at the higher frequencies where the consonant portion of speech is found, making communications difficult.

Area noise monitoring will be conducted by HSE Committee with a sound level meter to determine the need for personnel monitoring or engineering controls.

3.6 Housekeeping

All places of employment including outside areas should be kept as clean as the nature of the work allows but must be kept free and clear of pallets debris, trash, scrap, spills or other extraneous materials which could create a health or fire hazard and cause an accident.

Mechanical and electrical rooms will not be utilized for storage.

3.7 Electric Work Permits

The HSE committee and the concerned staff have to be contacted to obtain line permits to ensure a safe transition during renovation and construction projects. The permits include Hot Works, Utilities Shut down Request, Fire System Impairment etc.

4.0 Personal Protective Equipment

4.1 Introduction

4.2 Responsibilities

2.1 Building Team Leaders

2.2 Employees

2.3 EH&S

4.3 Program Components

4.3.1 Hazard Assessment and Equipment Selection

4.3.2 Types of Protective Devices

4.3.3 Eye and Face Protection

4.3.4 Head Protection

4.3.5 Foot Protection

4.3.6 Hand Protection

4.3.7 Cleaning and Maintenance

4.3.8 Training

4.3.9 Recordkeeping

4.4 General Guidelines for Choosing Personal Protective Equipment

4.1 Introduction

The objective of the Personal Protective Equipment (PPE) Program is to protect human beings from the risk of injury by creating a barrier against workplace hazards. Personal protective equipment is not a substitute for good engineering or administrative controls or good work practices, but should be used in conjunction with these controls to ensure the safety and health of employees. Personal protective equipment will be provided, used, and maintained when it has been determined that its use is required and that such use will lessen the likelihood of occupational injury and/or illness.

This program addresses eye, face, head, foot and hand protection.

4.2 Responsibilities

1. Building Team Leaders

Staff (faculty, technical staff and other staff) has the primary responsibility for implementation of the PPE Program in their work area. This involves:

- Providing appropriate PPE and making it available to employees.
- Ensuring employees are trained on the proper use, care, and cleaning of PPE.
- Coordinate with HSE Committee for maintaining records on PPE assignments and training.

- Supervising staff to ensure that the PPE Program elements are followed and that employees properly use and care for PPE.
- Notifying HSE Committee when new hazards are introduced or when processes are added or changed.
- Ensuring defective or damaged equipment is immediately replaced.

2. Students

The PPE user is responsible for following the requirements of the PPE Program. This involves:

- Wearing PPE as required.
- Attending required training sessions.
- Caring for, cleaning, and maintaining PPE as required.
- Informing the staff of the need to repair or replace PPE.

3. HSE Committee

HSE Committee is responsible for the development, implementation, and administration of the PPE Program. This involves:

- Conducting workplace hazard assessments to determine the presence of hazards which necessitate the use of PPE.
- Conducting periodic workplace reassessments as requested by supervisors and/or as determined by HSE Committee.
- Maintaining records on hazard assessments.
- Providing training and technical assistance to supervisors on the proper use, care, and cleaning of approved PPE.
- Providing guidance to the supervisor for the selection and purchase of approved PPE.
- Periodically re-evaluating the suitability of previously selected PPE.
- Reviewing, updating, and evaluating the overall effectiveness of the PPE Program.

4.3 Program Components

1. Hazard Assessment and Equipment Selection

HSE Committee/Concerned staff from the respective sections will determine the suitability of the PPE presently available and as necessary select new or additional equipment which ensures a level of protection greater than the minimum required to protect the employees from the hazards. Adequate protection against the highest level of each of the hazards will be provided or recommended for purchase.

2. Types of Protective Device

All personal protective clothing and equipment will be of safe design and construction for the work to be performed and shall be maintained in a sanitary and reliable condition. Careful consideration will be given to comfort and fit of PPE in order to ensure that it will be used. Protective devices are generally available in a variety of sizes. Care should be taken to ensure that the right size is selected.

3. Eye and Face Protection

Prevention of eye injuries requires that all persons who may be in eye hazard areas wear protective eyewear. This includes employees, visitors, researchers, contractors, or others passing through an identified eye hazard area. Suitable protectors shall be used when employees are exposed to hazards from flying particles, molten metal, acids or caustic liquids, chemical liquids, gases, or vapours, bio-aerosols, or potentially injurious light radiation.

- Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment.
- Goggles and face shields shall be used when there is a hazard from chemical splash.
- Face shields shall only be worn over primary eye protection (safety glasses or goggles).
- For employees who wear prescription lenses, eye protectors shall either incorporate the prescription in the design or fit properly over the prescription lenses.
- Protectors shall be marked to identify the manufacturer.
- Equipment fitted with appropriate filter lenses shall be used to protect against light radiation. Tinted and shaded lenses are not filter lenses unless they are marked or identified as such.

4. Head Protection

Head protection shall be furnished to, and used by, all employees, contractors, and visitors engaged in construction and other miscellaneous work.

5. Foot Protection

Safety shoes shall be worn in the shops, warehouses, maintenance, cage wash, glassware, and other areas as determined by HSE Committee. All safety footwear shall comply with relevant standards

6. Hand Protection

Suitable gloves shall be worn when hazards from chemicals, cuts, lacerations, abrasions, punctures, burns, biological agents, and harmful temperature extremes are present. Glove selection shall be based on performance characteristics of the gloves, conditions, duration of use, and hazards present. One type of glove will not work in all situations.

7. Cleaning and Maintenance

It is important that all PPE be kept clean and properly maintained. Personal protective equipment shall not be shared between employees until it has been properly cleaned and sanitized. PPE will be distributed for individual use whenever possible. It is also important to ensure that contaminated PPE which cannot be decontaminated is disposed of in a manner that protects employees from exposure to hazards.

8. Training

Any individual required to wear PPE shall receive training in the proper use and care of PPE. Periodic retraining shall be offered HSE Committee to both the employees and the students, as needed. The training shall include, but not necessarily be limited to, the following subjects:

- When PPE is necessary to be worn.
- What PPE is necessary
- How to properly don, doff, adjust, and wear PPE.
- The limitations of the PPE.
- The proper care, maintenance, useful life and disposal of the PPE.

9. Recordkeeping

Written records shall be kept of the names of persons trained, the type of training provided, and the dates when training occurred.

4.4 General Guidelines for Choosing Personal Protective Equipment

1. Description and Use of Eye/Face Protectors

- *Safety Glasses.* Protective eyeglasses are made with safety frames, tempered glass or plastic lenses, temples and side shields which provide eye protection from moderate impact and particles. Safety glasses are also available in prescription form for those persons who need corrective lenses.

- *Single Lens Goggles.* Vinyl framed goggles of soft pliable body design provide adequate eye protection from many hazards. Single lens goggles provide similar protection to spectacles and may be worn in combination with spectacles or corrective lenses to insure protection along with proper vision.
- *Face Shields.* These normally consist of an adjustable headgear and face shield of tinted/transparent acetate or polycarbonate materials, or wire screen. Face shields will be used in operations when the entire face needs protection and should be worn to protect eyes and face against flying particles, metal sparks, and chemical/biological splash.
- *Welding Shields.* These shield assemblies consist of vulcanized fibre or glass fibre body, a ratchet/button type adjustable headgear or cap attachment and a filter and cover plate holder. These shields will be provided to protect worker's eyes and face from infrared or radiant light burns, flying sparks, metal spatter and slag chips encountered during welding, brazing, soldering, resistance welding, bare or shielded electric arc welding and oxyacetylene welding and cutting operations.

2. Head Protection

Head injuries are caused by falling or flying objects, or by bumping the head against a fixed object.

Protective hats are made in the following types and classes:

- Class A - General Service, limited voltage. Intended for protection against impact hazards.
- Class B - Utility service, high voltage. Used by electrical workers.
- Class C - Special service, no voltage protection.

3. Foot Protection

There are many types and styles of protective footwear and it's important to realize that a particular job may require additional protection other than listed here.

Steel-Reinforced Safety Shoes - These shoes are designed to protect feet from common machinery hazards such as falling or rolling objects, cuts, and punctures. The entire toe box and insole are reinforced with steel, and the instep is protected by steel, aluminium, or plastic materials.

4. Hand Protection

Skin contact is a potential source of exposure to toxic materials; it is important that the proper steps be taken to prevent such contact. Gloves should be replaced periodically, depending on frequency of use and permeability to the substance(s) handled.

Gloves should also be worn whenever it is necessary to handle rough or sharp-edged objects, and very hot or very cold materials. The type of glove materials to be used in these situations, include leather, welder's gloves, aluminium-backed gloves, and other types of insulated glove materials.

The following is a guide to the most common types of protective work gloves and the types of hazards they can guard against:

- a. Disposable Gloves. Disposable gloves, usually made of light-weight plastic, can help guard against mild irritants
- b. Leather Gloves. These gloves are used to guard against injuries from sparks or scraping against rough surfaces. They are also used in combination with an insulated liner when working with electricity.
- c. Metal Mesh Gloves. These gloves are used to protect hands from accidental cuts and scratches. They are used most commonly by persons working with cutting tools or other sharp instruments.
- d. Chemical Resistance Gloves. These gloves may be made of rubber, neoprene, polyvinyl alcohol or vinyl, etc. When selecting chemical resistance gloves, be sure to consult the manufacturers' recommendations, especially if the gloved hand will be immersed in the chemical.

5.0 Fire Safety

- 5.1 Introduction
- 5.2 Fire and Life Safety Impairment Process
- 5.3 Flammable and Combustible Materials
- 5.4 Fire Extinguishers
- 5.5 Fire Safety Inspections/Housekeeping Procedures
- 5.6 Emergency Egress

5.1 Introduction

HSE Committee administers the fire prevention and life safety inspection programs. This includes reviewing all new building construction and renovations to ensure compliance with applicable state, local, and national fire and life safety standards. Routine surveys are also conducted of maintenance rooms and non-routine facilities such as offices and classrooms. Fire prevention measures propose to reduce the incidence of fires by eliminating opportunities for ignition of flammable materials.

5.2 Fire and Life Safety Impairment Process

It is MACE policy that, where feasible, its properties shall at all times be provided with automatic fire protection systems. When a facility's fire protection is impaired in any way, the HSE Committee shall be notified and arrangements made immediately to assure that the fire protection system is made operational as quickly as possible.

Responsibilities

- a) EH&S Department will be responsible for proper handling of the impairment and keeping a log of impairments.
- b) Staff/Students will assist with fire watches and monitoring of the fire panel during impairments.
- c) The parties conducting the impairment shall provide primary fire watch personnel. Additionally shall ensure all associated valves are open, fire panels & pumps and devices have been reactivated once the impairment has been completed.

5.3 Flammable and Combustible Materials

A. Substitution

Flammable liquids sometimes may be substituted by relatively safe materials in order to reduce the risk of fires. Any substituted material should be stable and nontoxic and should either be non-flammable or have a high flashpoint.

B. Storage

Flammable and combustible liquids require careful handling at all times. The proper storage of flammable liquids within a work area is very important in order to protect personnel from fire and other safety and health hazards.

Storage Inside Buildings:

- The storage of any flammable or combustible liquid shall not be stored as to limit use of exits stairways, or areas normally used for the safe egress of people.
- Containers of flammable or combustible liquids must remain tightly sealed, except when transferred, poured or utilized. Remove only that portion of liquid in the storage container required to accomplish a particular job.
- Flammable paints, oils, and varnishes in 1 or 5 litre containers, used for building maintenance purposes, may be stored temporarily in closed containers outside approved storage cabinets or room if kept at the job site for less than 10 calendar days.

C. Ventilation

Flammable and hazardous chemical storage rooms shall be provided with a continuous exhaust ventilation system. To prevent the accumulation of vapours, the location of both the makeup and exhaust air openings shall be arranged to provide, as far as practical, air movement directly to the exterior of the building and if ducts are used, they will not be used for any other purpose.

D. Elimination of Ignition Sources

All nonessential ignition sources must be eliminated where flammable liquids are used or stored. The following is a list of some of the more common potential ignition sources:

- *Open flames, such as Cutting and Welding Torches, Furnaces, Matches, and Heaters*
- *Electrical Sources of Ignition such as Motors, Switches and Circuit Breakers*
- *Mechanical Sparks*
- *Static sparks*

E. Removal of Incompatibles

Materials that can contribute to a flammable liquid fire should not be stored with flammable liquids. Examples are oxidizers and organic peroxides, which, on decomposition, can generate large amounts of oxygen.

F. Flammable Gases

Generally, flammable gases pose the same type of fire hazards as flammable liquids and their vapours. Many of the safeguards for flammable liquids also apply to flammable gases, other properties such as toxicity, reactivity, and corrosivity also must be taken into account. Also, a gas that is flammable could produce toxic combustion products.

5.4 Fire Extinguishers

A portable fire extinguisher is a "first aid" device and is very effective when used while the fire is small. The use of fire extinguisher that matches the class of fire, by a person who is well trained, can save both lives and property. Portable fire extinguishers must be installed in workplaces in accordance with relevant standards

A. Classification of Fires and Selection of Extinguishers

Types of Fires

Class A - Fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics. This would be offices, and labs that do not contain flammables.

Class B - Fires in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammables gases. This would include rooms or labs with flammable or combustible liquids.

Class C - Fires that involve electrical equipment where the electrical non-conductivity of the extinguishing media is important. (When electrical equipment is de-energized, fire extinguishers for Class A or Class B fires can be used. Included in this group would be rooms with highly sensitive computer equipment, such as servers.

Selection and Placement of Extinguishers

The selection of fire extinguishers for a given situation shall be determined by the characteristics of the fires anticipated, the construction and occupancy of the property, and the hazard to be protected. Extinguishers should have a label identifying the type of extinguisher and the type of fires for which it should be used.

- Fire extinguishers should be placed so the travel distance is no more than 25m.
- Fire extinguishers shall be kept in their designated places at all times when they are not being used.

- Fire extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably they should be located along paths of travel.
- Cabinets housing fire extinguishers shall not be locked.
- Portable fire extinguishers shall be securely installed on the hanger or in the bracket supplied or placed in the cabinets or wall recesses.

B. Inspections

Inspections are conducted by the EH&S department personnel on a quarterly basis. More frequent inspections will be conducted to meet specific accreditation requirements. Annual inspections will be completed by an approved contractor.

C. Maintenance

CO₂ and pressurized water extinguishers will be hydrostatically tested every 5 years.

Each fire extinguisher shall have a tag or label securely attached that indicates the month and year the maintenance was performed and that identifies the person performing the test and state license number.

A state licensed fire extinguisher service company contracted by the College will do hydrostatic tests.

5.5 Fire Safety Inspections/ Housekeeping

EH&S conducts routine facility safety surveys. These surveys will include observations of worksite safety and housekeeping issues and will specifically address proper storage of chemicals and supplies, unobstructed access to fire extinguishers, and emergency evacuation routes.

5.6 Emergency Egress

Every exit will be clearly visible, or the route to it conspicuously identified in such a manner that every occupant of the building will readily know the direction of escape from any point. At no time will exits be blocked.

Any doorway or passageway which is not an exit or access to an exit but which may be mistaken for an exit, will be identified by a sign reading "**Not An Exit**" or a sign indicating its actual use (i.e., "Store room"). Exits and accesses to exits will be marked by a readily visible sign.

6.0 Incident Reporting System and Investigation Procedure

- 6.1 Introduction
- 6.2 Applicability and Scope
- 6.3 Responsibilities
- 6.4 Reporting Procedures and Practices
- 6.5 Incident Investigation

6.1 Introduction

MACE Incident Reporting System is designed to:

1. Track and analyze employee/student injuries and illnesses, property and vehicle damage, as well as serious events or near misses which might have resulted in personal injury, illness, or property and vehicle damage.
2. Initiate the workers' compensation process, if necessary.
3. Meet regulatory reporting requirements.

All incidents (incidents resulting in injury or causing illness to MACE employees/students) shall be reported in order to facilitate investigations, establish a written record of factors, and to provide statistical information for incident tracking.

6.2 Applicability and Scope

The Incident Reporting System requirements apply to all incidences involving MACE personnel arising out of or in the course of employment which results in (or might have resulted in) personal injury, illness, and/or property and vehicle damage.

A. Incidents (Occupational injuries and illnesses)

Injuries and illnesses that require reporting include those injuries and illnesses occurring on the job (at the time of discharging the duty) which result in any of the following: lost work time, work restrictions, requirement for first aid or outside medical attention, permanent physical bodily damages, or death.

Examples of reportable injuries and illnesses include, but are not limited to, heat exhaustion from working in hot environments, strained back muscles from moving equipment, acid burns on fingers, etc.

Other incidents requiring reporting include those incidents occurring on the job which result in any of the following: injury or illness, damage to a State vehicle, fire/explosion, property damage, or chemical releases requiring evacuation of at least that immediate spill area.

B. Events (Near Misses)

Near misses even though they may not result in actual or observable injury, illness, death, or property damage are still required to be reported. The information obtained from such reporting can be extremely useful in identifying and mitigating problems before they result in actual personal or property damage.

Examples of near miss incidences required to be reported include the falling of a compressed gas cylinder, overexposures to chemical, biological, or physical agents (not resulting in an immediately observable manifestation of illness or injury), and slipping and falling on a wet surface without injury.

6.3 Responsibilities

All MACE personnel (students and staff) have a responsibility to report all occupational injuries and illnesses, and other incidents or events under MACE Incident Reporting System.

A. HSE Committee

EHS has the overall responsibility for implementing the Incident Reporting System, including review of incident/event reports, recommendation of corrective and/or preventive actions, and maintaining records.

B. Staff

Employees are primarily responsible for ensuring that MACE First Report of Injury Form is completed and that all copies are sent to the appropriate locations.

C. Students

All students have the responsibility to initiate the incident reporting sequence by informing their staff advisor immediately of an actual or potential injury or illness as soon as possible after an incident has occurred.

6.4 Incident Reporting Procedures and Practices

This section describes the specific procedures that shall be followed by MACE personnel in order to effectively report occupational injuries and illnesses and other incidents or events.

A. Incidents (Injuries and Illnesses)

Serious injury or illness posing a life-threatening situation shall be reported immediately by contacting EHS Committee

Injuries and illnesses shall be reported by the injured employee to his or her supervisor in person or by phone as soon after any life-threatening situation has been addressed. If the injured employee is unable to report immediately, then the incident should be reported as soon as possible. Upon notification of an occupational injury or illness, the staff should complete the First Report of Injury.

B. Events

Incidents not involving injury or illness, but resulting in property damage, must also be reported on the First Report of Injury within 48 hours of the incident. In cases of a fire or explosion that cannot be controlled by one person, vehicular accident, or a chemical release requiring a building evacuation, the involved party must immediately report the incident to the emergency response services in the area (police, fire, etc.) If injuries or illnesses occur, the reporting must follow those procedures outlined in Section A above.

All near miss incidences are also required to be reported on the First Report of Injury within 48 hours of occurrence. In place of indicating the result of the incident (i.e., actual personal or property damage), the reporting person shall indicate the avoided injury or damage.

6.5 Incident Investigations

HSE Committee will review each reported incident and event sent to them to:

1. Determine if further investigation is required and then perform the investigation.
2. Make recommendations for corrective and/or preventative actions necessary to reduce or eliminate hazardous conditions and monitor the status of the abatement actions.

7.0 Facility Planning & Engineering Services Safety

- 7.1 Hot Works Permit and Utility Shut Down request
- 7.2 General Shop and Work Area Safety
- 7.3 Electrical Equipment and Lock-out / Tag-out
- 7.4 Machinery
- 7.5 Carpentry and Structural Maintenance
- 7.6 Painting Operations
- 7.7 Renovation and Construction Sites

7.1 Hot Works permits and Utility Shut-Down request

A. Hot Works permit

This procedure has been prepared as a guide for contractors, building maintenance, and equipment repair personnel (including persons who perform cutting and welding), fire watchers, and their supervisors (including outside contractors).

Before any welding or cutting begins, the supervising personnel shall:

- Establish approved areas for cutting and welding or establish procedures for approval of cutting and welding operations;
- Designate an individual responsible to authorize cutting and welding operations in areas not specifically designed or approved for such processes. The individual shall be aware of the fire hazards involved and shall be familiar with the provisions of this guide;
- Ensure that only **approved** apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used;
- Ensure that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment, and emergency procedures in the event of a fire;
- Select contractors to perform cutting or welding who employ suitably trained personnel and who have an awareness of the magnitude of the risks involved;
- Advise all contractors of their duties and responsibilities during "hot works" operations.

Before cutting and/or welding, a "hot works" permit must be obtained from the Safety Co-ordinator and concerned staff in charge. The area shall be inspected by the supervisor responsible for the work and if necessary by Safety Co-ordinator to ensure that:

- Cutting and welding equipment is in satisfactory operating condition;
- All combustible materials in the area have been moved to a safe distance from the work or the combustibles have been properly shielded from ignition sources;

- The supervisor shall ensure that appropriate fire protection and extinguishing equipment are properly located on site;
- The supervisor shall make arrangements for a fire-watch to remain on site at least one-half hour after the completion of cutting or welding operations to detect and extinguish possible smouldering fires

Before cutting or welding is permitted and at least once per day while the permit is in effect, the area shall be inspected by the designated representative to ensure that it is a fire safe area. This individual shall designate precautions to be followed on the "hot works" permit. This individual shall sign the permit and notify HSE Committee that the work is authorized, and shall verify the precautions noted on the permit are being followed.

Ventilation

Adequate ventilation (natural, mechanical, or respirator) must be provided for all welding, cutting, brazing, and related operations. Adequate ventilation depends upon the following factors:

- Volume and configuration of space in which operations occur;
- Number and type of operations generating contaminants;
- Allowable levels of specific toxic or flammable contaminants being generated;
- Natural airflow (rate and direction) and general atmospheric conditions where work is being done;
- Location of the welder and other person's breathing zones in relation to the contaminants or sources;
- Natural ventilation is acceptable for welding, cutting, and related processes where the necessary precautions have been taken to keep the welder's breathing zone away from the welding or brazing plume.

B. Utility Shut-Down request

All utility shut-down requests must be submitted a minimum of **five (5) days** prior to the requested shutdown date.

Example of systems requiring Utility Shut Down request:

- Emergency exits, building entrances, parking lots, domestic water supply, electrical, ventilation systems and HVAC

7.2 General Shop/Work Areas

A. Employee Training

Employees shall be thoroughly trained in the use of protective equipment, guards, and safeguards for chemicals and safe operation of equipment, machines, and tools they use or operate. Only employees who have been trained shall be allowed to use shop equipment, machines, and tools.

B. Personal Protective Equipment

Refer **Chapter 4** for details on **Personal Protective Equipment**

C. Shop Layout

Proper layout, spacing, and arrangement of equipment, machinery, passageways, and aisles are essential to orderly operations and to avoid congestion.

- Equipment and machinery shall be arranged to permit an even flow of materials and to provide sufficient space to handle the material with the least possible interference from or to workers or other work being performed.
- Passageways/aisles shall be provided and marked to permit the free movement of employees bringing and removing material from the shop. These passageways are independent of clear zones and storage spaces. They shall be clearly recognizable.
- Where powered materials handling equipment is used, facility layout shall provide enough clearance in aisles, on loading docks, and through doorways to permit safe turns. Aisles shall be at least 3 feet wider than the widest vehicle used or most common material being transported

D. Illumination

Adequate illumination shall be provided to ensure safe working conditions.

1. Portable lamps shall have approved plugs, handles, sockets, guards, and cords for normal working conditions.
2. Flashlights for use near energized electrical equipment and circuitry shall have insulated cases.
3. At least 50 foot-candles of illumination shall be provided at all workstations. However, fine work may require 100 foot-candles or more. This can be obtained with a combination of general lighting plus supplemental lighting.

E. Exits and Exit Markings

Every exit shall have "EXIT" sign in plain legible letters not less than 6 inches high with the strokes of the letters not less than three-quarters of an inch wide. Doors, passageways, or stairways which are neither exits nor ways to an exit (but may be mistaken for an exit) shall be clearly marked "NOT AN EXIT" or by a sign indicating their actual use, for example: "STORAGE ROOM" or "BASEMENT."

When the direction to the nearest exit may not be apparent to an occupant, an exit sign with an arrow indicating direction shall be used.

Exit signs shall be clearly visible from all directions of egress and shall not be obstructed at any time. If occupancy is permitted at night, or if normal lighting levels are reduced at times during working hours, exit signs shall be suitably illuminated by a reliable light source.

A door from a room to an exit or to a way of exit access will be the side-hinged swinging type and will swing in the direction of travel if 50 or more persons occupy the room.

Areas around exit doors and passageways shall be free of obstructions. The exit route shall lead to a public way. No lock fastening device shall be used to prevent escape from inside the building.

Where occupants may be endangered by the blocking of any single exit due to fire or smoke, there shall be at least two means of exit remote from each other.

Exits, exterior steps, and ramps shall be adequately lit to prevent mishaps.

F. Housekeeping

Good housekeeping shall be maintained in all shops, yards, buildings, mechanical rooms, chases and mobile equipment. Supervisors are responsible for good housekeeping in or around the work they are supervising. As a minimum, the following requirements shall be adhered to:

- Material shall not be placed where anyone might stumble over it, where it might fall on someone, or on or against any support unless the support can withstand the additional weight.
- Aisles and passageways shall be kept clear of tripping hazards.
- Nails shall be removed from loose lumber or the points turned down.
- Mechanical and electrical rooms will not be utilized for storage, of spare parts, construction supplies, and other articles. But instead will be kept clean and properly illuminated to allow access for maintenance.

G. Fire Prevention

All personnel shall receive fire prevention training as part of their general training.

1. Supervisors in charge of operations where fuels, solvents, or other flammable liquids are used shall be constantly alert for hazards and unsafe acts. Open flames, open element heaters, equipment not properly grounded and non-explosion-proof electrical equipment used in the presence of flammable or combustible liquids shall be avoided.
2. Fire extinguishers shall be installed in shop areas. The number of extinguishers depends upon the size and layout of the facility.
3. Supervisors shall ensure that employees remove construction debris and rubbish from the job site upon completion of the job, or daily if extended beyond one day.
4. Interim Life Safety Measures (ILSM) shall be developed to ensure, during an emergency the occupants have an un-obstructed egress to safety.

H. Material Storage

All unnecessary accumulation of materials and supplies in the shop area shall be avoided.

1. The storage of materials shall not, of itself, create a hazard. Materials stored in tiers shall be stacked, strapped, blocked or interlocked, and limited in height so they are stable and secure against sliding or collapse. Storage racks shall have sufficient capacity to bear the loads imposed on them.
2. Stored materials shall not obstruct fire extinguishers, alarm boxes, sprinkler system controls, electrical switch boxes, machine operations, emergency lighting, first aid or emergency equipment, or exits.
3. Heavy materials and equipment should be stored low and close to the ground or floor to reduce the possibility of injury during handling.
4. All passageways and storerooms shall be maintained clean, unobstructed, dry, and in sanitary condition. Spills will be promptly removed.
5. Where mechanical handling equipment, such as lift trucks are used, safety clearance shall be provided for aisles at loading docks, through doorways, and wherever turns or passages must be made. No obstructions that could create a hazard are permitted in aisles.

I. Use of Tools

1. Hand Tools

Incidents at the job site involving hand tools are usually the result of misuse. Hand tools are precision tools capable of performing many jobs when used properly. Hand tool safety requires that the tools be of good quality and adequate for the job. All tools shall be kept in good repair and shall be stored properly.

When personnel use hand tools while they are working on ladders, scaffolds, platforms, or work stands, they shall use carrying bags for tools which are not in use.

Supervisors shall frequently inspect all hand tools used in the operation under their supervision. Defective tools shall be immediately removed from service and tagged.

2. Portable Power Tools

Portable power tools can be more hazardous to use than their stationary counterparts. Personnel who are required to use portable power tools in their work shall be thoroughly trained in safe operating practices. Safe operating procedures shall be set up for each type of tool consistent with the manufacturer's instructions.

J. Working Safely at Elevations

These procedures are designed to prevent the injury of personnel due to falls or slips any time personnel are working on portable stairs, ladders, or scaffolding, or at elevations of more than four feet above grade.

1. Scaffolding and Elevated Platforms

- a. Only tube and coupler or tubular welded frame scaffolding shall be used by the concerned personnel
- b. All platforms or scaffolds shall be inspected by the supervisor before use.
- c. All elevated platforms shall be surrounded by a standard guardrail, securely fastened to a stationary object
- d. Scaffolds with wheels constructed on the base (bottom) section shall not be used unless all wheels are intact and at least one wheel on each side is locked to prevent movement.
- e. The following are general scaffolding rules:
 - Know scaffolding safety rules prior to set up, during operations, and for dismantling of scaffolding. Ensure manufacturer's instructions and safety warnings are legible and remain on scaffolding.
 - Inspect the equipment before use for damage or deterioration.
 - Keep equipment in good repair.
 - Inspect erected scaffolds regularly to ensure they are maintained in a safe condition.
 - Provide adequate sills and posts and use base plates.
 - Anchor wall scaffolds securely between structure and scaffold.
 - Use caution when working near power lines. Never be any closer than ten feet to electrical power lines.
 - Use adjusting screws instead of blocking to adjust for uneven grades.

- Use outriggers where so equipped.
- Equip all planked areas with proper guard rails and toe-boards.
- Do not ride rolling scaffolding.
- Do not leave materials and equipment on the platform when moving scaffolding.
- Do not try to move rolling scaffolding without help..
- Do not let working platform height exceed four times the smallest base dimension unless guyed or otherwise stabilized.
- Do not overload scaffold.
- Do not use ladders or makeshift devices on top of scaffolds to increase height.
- Ensure the footing and anchorage for scaffolds are sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Do not use unstable objects such as barrels, boxes, loose bricks or concrete blocks, etc., to support scaffolds or planks.

2. Rooftop Work

If the rooftop is not provided with an adequate guardrail, the following procedures shall apply:

No employee shall come within 10 feet of the roof's edge without wearing a harness securely attached to an anchored rope or line. No employee shall work on the rooftop if the wind speed exceeds 35 kms per hour.

Barricades

Appropriate barriers shall be erected around excavations, open manholes, open electrical panels, or other such operations that present hazards to personnel working in or near the affected area. Barricades shall delineate the boundaries of work areas. Signs must be posted to warn people of dangers and to identify protective equipment required while in the work zone.

7.3 Electrical Equipment and Lock-out / Tag-out

A. Hazards

Hazards associated with electrical equipment include personnel electrocution or shock, fires, and explosions.

B. Requirements

Electrical installation and utilization equipment will be in accordance with the current edition of the National Electrical Code. This code will also apply to every replacement, installation, or utilization equipment.

Frames of all electrical equipment, regardless of voltage shall be grounded.

Exposed non-current carrying metal parts of electrical equipment that may become energized under abnormal conditions shall be grounded in accordance with the National Electrical Code.

Wires shall be covered wherever they are joined, such as: outlets, switches, junction boxes, etc.

Parts of electrical equipment which in ordinary operation produce arcs, sparks, etc., shall not be operated or used in explosive atmospheres or in close proximity to combustible materials.

Equipment connected by flexible extension cords shall be grounded either by a 3-wire cord or by a separate ground wire (except double insulated equipment).

MCBs shall be used on all 240-volt, single-phase, 15 and 20 ampere receptacle outlets at job sites when the receptacles are not a part of the permanent wiring of the building or structure.

C. Inspections

Supervisors will ensure that work areas are inspected for possible electrical hazards.

Sufficient workspace shall be provided and maintained around electric equipment to permit safe operations and maintenance of such equipment.

D. Control of Hazardous Energy (Lock-Out/Tag-Out)

The accidental release of energy during maintenance work can and frequently does cause severe injuries, amputations, and death. Energy can be present in the form of electricity, potential energy (due to gravity) stored in elevated masses, chemical corrosivity, chemical toxicity, or pressure.

These procedures apply to all maintenance or installation operations conducted at MACE facilities.

1. Tag-out Devices

Tags affixed to energy isolating devices are warning devices that do not provide the physical restraint on those devices that a lock would provide. Any tag so attached to an energy-isolating device must not be removed without authorization of the person attaching it, and it must never be bypassed, ignored, or otherwise defeated. Tags must be legible and understandable in order to be effective. Tags must be made of materials, which will withstand environmental conditions encountered in the workplace. When utilized, tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use. Tag-out devices must be substantial enough to prevent inadvertent or accidental removal. Tag-out devices must warn against hazardous conditions if the machine or equipment is energized and must include appropriate warnings.

2. Lock-out Devices

- a) Lockout devices and practices vary by nature and function. Several effective lockout devices and practices are listed as follows:
- b) Key operated padlocks are recommended and should be assigned individually.
- c) Multiple lock adapters will enable more than one worker to place their own padlock on the isolating device.
- d) Chains or other commercially available devices should be used to prevent valves from being opened or, in some cases, closed. The principle of multiple lock adapters still applies even when chains or other devices are used on operations requiring more than one employee.

3. Procedures

If energy-isolating devices are not capable of being locked out, they must be modified so that they are capable of being locked out whenever major replacement, repair, renovation, or modification of the machine or equipment takes place.

If an isolating device cannot be locked out for any reason, then additional steps must be taken to assure full employee protection such as removing fuses, blocking switches, blanking off lines, etc.

If the machine or equipment is not capable of being locked out, a tag-out procedure must be documented and utilized. The tag-out procedure must provide full employee protection equivalent to a lockout system.

Plug/Cord and Hose-Connected Type Equipment

When servicing or installing plug/cord or hose connected electrical, pneumatic, or hydraulically powered equipment, the cord or hose shall be disconnected from the equipment to be worked on, prior to starting the work. A tag warning against reconnecting the plug or hose shall be affixed to the plug or hose end.

Any stored energy (e.g., capacitor voltage, hydraulic pressure) shall be safely released prior to the start of maintenance or installation work.

Electrically Powered Equipment

Electrically powered equipment shall be de-energized and their source of electricity manually disconnected from them prior to the removal of protective covers or the start of other maintenance or installation work.

The lock-out/tag-out procedure is as follows:

1. Each person working on the circuit or piece of equipment shall place a padlock and warning tag on the electrical isolation device (e.g., disconnect switch).
2. Each person working on the circuit or piece of equipment shall attempt to energize or start the piece of equipment prior to starting work. Each on/off switch capable of energizing the equipment must be "tried."
3. If the try step reveals that the equipment is capable of being energized, the proper disconnects must be located and locked out and the try step repeated.
4. As each person completes his or her task, they shall remove their padlock and tag from the energy isolation device.
5. All protective covers or panels shall be securely re-attached prior to energizing the equipment after work is completed. In the event that protective covers must be removed to make adjustments on energized equipment, appropriate guards must be constructed and attached in such a manner as to prevent employee contact with live circuitry capable of causing human injury.

Stored Mechanical Energy

In situations where equipment to be worked on has stored mechanical energy (e.g., in a flywheel or drop hammer), the stored energy must be released or blocked in a safe manner before starting maintenance or installation work. Effective blocking practices may include the installation of safety blocks or adequate supports.

E. Training

Training shall be provided to employees to ensure that they understand the purpose and function of the lock-out/tag-out program and procedures, and that they have the knowledge and skills required for the safe application, usage, and removal of energy controls.

1. Personnel who work around electrical equipment but who do not perform a primary duty of electrical system installation or maintenance will be briefed by their supervisor on the hazards of electricity and the proper precautions to observe.
2. Each authorized employee who will use a lock-out/tag-out procedure must receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for isolation and control. All training for such activities shall be documented and maintained by HSE Committee
3. Employees must be retrained whenever there is a change in their job assignment; a change in machines, equipment, or processes that present a new hazard; or when there is a change in the lock-out/tag-out procedures.

7.4 Machinery

All mechanical motion is potentially hazardous. Motion hazards, such as rotating devices, cutting or shearing blades, in-running nip points, reciprocating parts, linear moving belts and pulleys, meshing gears, and uncontrolled movement of failing parts, are examples of motion associated with machinery.

A. General

1. Personnel Training

- Personnel should be trained to safely operate each machine they will be required to use; to recognize potential accident producing situations and to know what to do when hazards are discovered.

2. Personal Protective Equipment

- Eye protection or face shields will be worn by all personnel within areas where machines are operated.
- Loose fitting clothing, neckties, rings, bracelets, or other apparel that may become entangled in moving machinery will not be worn by machine operators or their helpers.
- Hair nets or caps will be worn to keep long hair away from moving machinery.
- Gloves will not be worn where there is a chance of them being caught in machinery.
- Ear plugs or muffs will be used when required for worker protection.

3. Environmental

- Machines designed for fixed locations will normally be securely fastened to the floor or other suitable foundation to eliminate all movement or "walking." Machines equipped with rubber feet, non-skid foot pads, or similar vibration dampening materials will be installed according to the manufacturer's recommendations. Machines that have the potential of tipping or falling over will be firmly secured.
- Machines that develop fine dust and fumes will be equipped with effective exhaust hoods, connected to an effective exhaust system. An interlocking device should be installed to link the machine's power supply and the exhaust system to prevent the operation of machines without the exhaust system operating.
- Machines will never be left unattended with the power unless the worker is operating more than one machine in a battery of machines.
- No attempt will be made to clean any part of a machine until the moving parts have come to a complete stop.
- Brushes, swabs, lubricating rolls, and automatic or manual pressure guns will be used

4. Maintenance/Repair

- When maintenance or repair is needed, machines will be completely shut down and the control switch(es) locked and tagged in the "OFF" position.
- Cutting tools will be kept sharp and forming tools well dressed and free from accumulations of chips, dust, and other foreign matter. Where two or more cutting tools are used in one cutting head, they will be properly adjusted and balanced.
- Damaged cutting tools will be removed from service, and repaired or replaced.

Many accidents are caused by machinery that is improperly guarded or not guarded at all. An important factor that must be kept in mind relative to machinery guarding is that no mechanical motion that threatens a worker's safety should be left without a safeguard.

7.5 Refrigeration and Air Conditioning Maintenance

A. Hazards

Potential hazards associated with refrigeration and air conditioning maintenance include hazardous noise, electrical hazards, exposure to refrigerants, lifting hazards, and compressed gases and cylinders.

B. General Requirements

1. Equipment rooms where air conditioning equipment is installed shall be kept free and clear of all trash and clutter which could present tripping or fire hazards. Refrigerant piping shall be properly insulated, both to improve operating efficiency and to prevent injury to workers who may accidentally come in contact with it. Equipment rooms are not normally designed for, nor intended for, storage of materials.
2. All belts, pulleys, and rotating shafts shall be guarded to prevent accidental contact. Large valve handle stems which can present a bump or trip hazard shall be marked (colour coded) for easy recognition.
3. Electrical parts of the equipment and controls shall have all covers and plates in place. Wiring shall be properly secured to the equipment or structure.

C. Storage and Handling

1. Workers shall ensure that containers are legibly marked with the type of gas contained and stored with minimum intermingling of types of refrigerant. Cylinders shall be stored separately from flammable gases and oxygen.
2. Where caps have been provided for valve protection, they shall be kept in place at all times until the cylinder is actually in use.
3. Cylinders shall not be dragged, slid, dropped, or allowed to strike each other or solid objects violently.
4. Containers shall never be lifted by the valve. Cylinders shall not be suspended by chains, ropes, or slings unless the manufacturer has provided appropriate attachment points.
5. Storage areas shall be legibly marked with the names of the gases being stored. Cylinders shall always be secured.

7.6 Renovation and Construction Sites

Remodelling Services shall prepare and carry out an effective fire protection and prevention plan. This plan shall include the components listed below.

a. *Housekeeping.* Good housekeeping, with provision for prompt removal and disposal of accumulations of combustible scrap and debris, shall be maintained in all areas of the jobsite. Self-closing metal containers shall be used for disposal of waste saturated with flammable liquids.

b. *Codes and regulations.* Remodelling Services shall comply with the requirements published in the current revisions of the NEC standards.

c. *Smoking.* Smoking or other sources of ignition shall not be permitted in areas where flammable or explosive materials are stored or are present. All such areas shall be conspicuously posted: NO SMOKING OR OPEN FLAMES. There is a no smoking policy in effect within all MACE facilities.

d. *Fires Detection Point Isolation.* When the potential for generation of smoke or heavy dust exists while performing a job, the building fire detection system shall be isolated at the panel in that building. The smoke detector heads shall never be covered with a bag or glove as an isolation method.

e. *Cleaning and degreasing.* Gasoline and liquids with a flash point below 35 degrees Celsius shall not be used for cleaning and degreasing.

f. *Building exits.* All buildings, shops, and plant facilities in which employees are required to work shall have at least two well-marked and lighted exits. The two exits shall be arranged to minimize the possibility of both exits being rendered inaccessible by one fire or emergency condition.

7.7 Ladder Safety

Falls are the primary hazard associated with the use of ladders. Falls result from a number of unsafe acts and conditions such as:

- 1) Ladders being set on unstable surfaces.
- 2) Personnel reaching too far out to the sides.
- 3) Personnel standing too high to maintain balance.
- 4) Personnel using defective ladders (e.g., broken rails, rungs, missing hardware).

These hazards are minimized if workers adhere to proper ladder safety practices and if supervisors ensure equipment is used, inspected, and maintained in good condition. Tasks which require frequent use of ladders and involve significant climbing effort must be accomplished by workers capable of the physical exertion required under these conditions.

(At all times personnel must maintain a three point contact with the ladder)

A. Requirements

- Portable ladders procured for MACE shall be of fibre-glass construction.
- Portable ladders shall be equipped with nonslip bases such as safety feet or spikes, depending upon the type of usage.
- Metal ladders shall not be used in applications where the ladder or employee may be exposed to live electrical parts.

B. Care of Ladders

- Handle ladders with care. Do not drop, jar or misuse them.
- Ladders shall be stored in a manner that will provide easy access for inspection and will permit safe withdrawal for use. They shall not be stored in a manner that presents a tripping hazard not where they can fall on someone. They should be stored in a manner that will prevent sagging.
- Lubricate metal bearings of locks, wheels, pulleys, etc., as required to keep them working.
- Replace frayed or badly worn rope.
- Keep safety feet and other parts in good condition to ensure they work.
- Maintain ladders in good usable condition. Inspect ladders prior to use.
- Ladders with defects which cannot be immediately repaired, shall be removed from service for repair or destruction, and shall be tagged with a “Danger” tag.

C. Proper Use of Ladders

The correct procedures for using ladders are as follows:

- 1) Where possible, portable non-self-supporting ladders will be used at such a pitch that the base of the ladder is placed one foot from the vertical wall for every four feet of height. The ladder shall be placed to prevent slipping, or it will be lashed or manually held in position.
- 2) Ladders shall not be used by more than one person at a time.
- 3) Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded.
- 4) Do not place ladders on boxes, barrels, or other unstable bases to obtain additional height.
- 5) To support the top of the ladder at a window opening, attach a board across the back of the ladder, extending across the window to provide firm support against the building walls or window frames.
- 6) When ascending or descending, users shall face the ladder and use both hands.
- 7) Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other defects shall not be used. Do not make improvised repairs.
- 8) Do not splice short ladders together to provide long sections.
- 9) Do not use ladders as guys, braces, skids, horizontal platforms or scaffolds, or for other than their intended purposes.
- 10) Do not use a ladder to aid access to a roof unless the top of the ladder extends at least 3 feet above the point of support, at eave, gutter, or roof line.

- 11) Always raise extension ladders so that the upper section overlaps and rests on the bottom section. The upper section will always overlap on the climbing side of the extension ladder.
- 12) Nonslip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used upon oily, metal, concrete, or slippery surfaces.
- 13) The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing.
- 14) Hooks may be attached at or near the top of portable ladders to provide added stability.
- 15) When the ladder can be knocked over by others who are working in the area, the ladder will be securely fastened. As an alternative, someone will be assigned to steady the bottom, or the area around the ladder will be roped off.
- 16) Workers shall not stand higher than the third rung/ step from the ladder top and shall not attempt to reach beyond a normal arm's length.

7.8 Elevator safety

Hazards Associated with Elevator

The following hazards, among others, can lead to personal injury/death:

- Structural failures (collapses),
- Electric shock (electrocutions),
- Getting trapped between the doors
- Malfunctioning of the lift may lead to mental shock

A. Requirements

Elevators should meet the standard safety requirements which include automatic door retrieval mechanism, sufficient fresh air supply, protection from electrical shock, in-room telephone facility, emergency stop button, overload checks etc. Those who are using elevator should follow the standard safety procedures

B. Elevator care

Proper periodic maintenance and servicing by authorized persons, at least on annual basis is necessary

Ensure that elevator floor is dry

Any malfunctioning such as improper acceleration/deceleration, jerks, noise, door opening/closing issues, of the elevator and its accessories including fan, telephone should be reported to EHS committee.

C. Proper use of elevators

Watch your step when entering or exiting an elevator.

- Stand aside and allow exiting passengers to get off before entering.

Enter the elevator well before it starts moving, select the floor and close the door.

- Push and hold the DOOR OPEN button if doors need to be held open for someone approaching to get on; don't hold open using your arms or feet.

Watch the floor level indicator and exit when it stops in the selected floor

- Use the stairs if there is a fire in the building or other situation that could lead to a disruption in electrical service. Elevator shafts are often not sealed and act as a chimney when fire is present.
- Check the posted capacity of elevators and not get onto an elevator that is already at capacity. Wait for the next elevator if the car is full or if there is not enough room to stand comfortably in the elevator cabin.

8.0 Contractor Safety

- 8.1 Introduction
- 8.2 Responsibilities
- 8.3 Health and Safety Plan
- 8.4 Pre-Construction Meeting
- 8.5 Fire Prevention and Protection
- 8.6 Non-Compliance with Health and Safety Requirements
- 8.7 Safety Training
- 8.8 Medical Clearance
- 8.9 Incident Reporting
- 8.10 Safety and Personal Protective Equipment
- 8.11 Documentation

8.1 Introduction

MACE as an employer is also responsible for providing a safe and healthful work environment for its employees. Contract work, especially in occupied buildings, may present situations or conditions that may adversely impact on the safety and health of employees.

8.2 Responsibilities

All MACE personnel responsible for managing contracts will ensure that:

- Each contractor is provided with warnings of hazards and information about programs for abating these hazards;
- Each contractor is informed of MACE safety, health, and environmental requirements; and
- The work is conducted in a safe and responsible manner in compliance with applicable regulations and requirements.

Project Manager

The Project Manager will, prior to the start of the contract, inform the contractor of the requirement to observe all environmental, health, and safety provisions specified in the contract, provided by statutes/regulations or otherwise required.

The Project Manager and his/her representative will:

- 1) Ensure HSE Committee is provided with a copy of the contractor's written health and safety plan for review prior to the pre-construction meeting with the contractor.
- 2) Ensure HSE Committee is represented at all pre-construction meetings held with contractors.

- 3) Provide HSE Committee with a tentative construction schedule for contractors' on-site and immediate written notification of changes.
- 4) Notify HSE Committee of contractor work schedule, location, and special precautions or concerns prior to the start of the project.
- 5) Monitor the contractor's work performance and determine if contractor is complying with the contract health and safety plan and pertinent environmental, health, and safety regulations. Any questions regarding compliance with specific regulations should be referred HSE Committee.
- 6) Ensure that all required permits are completed by the contractor and provided for review and signature of an authorized person.
- 7) Notify HSE Committee immediately of construction accidents and provide EH&S with a copy of the contractor's accident reports.
- 8) Notify HSE Committee immediately of an OSHA complaint and/or inspection of contractor's jobsite.

Environmental Health & Safety

Health Safety & Environment (HSE) Committee will conduct a pre-solicitation project review of the contract to ensure that all appropriate health and safety regulations and requirements and pertinent work site hazard information have been incorporated, where necessary. HSE Committee will document review of the plan and will note any areas of special concerns.

HSE Committee will review and monitor the contractor's adherence to its written health and safety plan and all applicable environmental, health, and safety requirements.

Contractor

A firm or individual contracted to MACE is responsible for meeting all contractual agreements and for providing a safe and healthy workplace for its employees.

The contractor will:

- 1) Provide for frequent and regular safety inspections of the worksites by a competent employee.
- 2) Notify the Project Manager of construction accidents in a timely manner.
- 3) Protect workers and pedestrians, by installing barricades to delineate the boundaries of work areas. Signs must be posted to warn people of dangers and to identify protective equipment required while in the work zone.
- 4) Certify that their employees have been trained in all regulatory requirements pertaining to the work to be performed.
- 5) Ensure that all their employees prominently displayed ID badges on their clothing.

8.3 Health and Safety Plan

When required by the contract, the contractor must develop and implement a comprehensive health and safety plan for his or her employees in which covers all aspects of onsite construction operations and activities associated with the contract. This plan must comply with all applicable health and safety regulations and any project-specific requirements that MACE has specified.

8.4 Preconstruction Meeting

Representatives of the contractor shall meet with the Procurement Officer, Project Manager, and HSE Committee member prior to the start of construction for the purpose of reviewing safety requirements and discussing implementation of all health and safety provisions pertinent to the work under contract.

EH&S will, during the pre-construction meeting, provide the contractor with information on Hot Works and Fire and Life Safety Impairment permit process.

8.5 Fire Prevention and Protection

The contractor shall prepare and carry out an effective fire protection and prevention plan, including provisions for the fire protection and suppression equipment set forth in this section.

- *Housekeeping.* Good housekeeping, with provision for prompt removal and disposal of accumulations of combustible scrap and debris, shall be maintained in all areas of the jobsite.
- *Codes and regulations.* The contractor shall comply with the requirements published in the current revisions of the National Electrical Code and the National Fire Protection Association standards.
- *Smoking.* There is a no smoking policy in effect within all MACE facilities.
- *Fires.* Fires and open flame devices shall not be left unattended.
- *Cleaning and degreasing.* Gasoline and liquids with a flash point below 100 degrees Fahrenheit shall not be used for cleaning and degreasing.
- *Building exits.* All buildings, shops, and plant facilities in which employees are required to work shall have at least two well-marked and lighted exits.
- *Fire extinguishers.* Distinctly marked fire extinguishers shall be suitably placed

8.6 Noncompliance with Safety and Health Requirements

If during the course of the contract, HSE Committee takes note of any situations of non-compliance with the contractor's safety and health plan or MACE safety and health requirements, HSE Committee will bring them to the attention of the Project Manager and the Procurement Officer verbally and will immediately follow-up in writing. Failure to correct the violation or continued violations shall be grounds for termination of the contract.

If after notifying the Project Manager and Procurement Officer in writing of deficiencies in any health, safety, or environmental requirements, HSE Committee find continued violations of those requirements, or find actions that pose an imminent danger, an immediate order to stop work will be issued.

8.7 Safety Training

The contractor must ensure that its employees have completed appropriate health and safety training when required by statute/regulation and MACE requirements and provide documentation of such training when required by the contract.

8.8 Medical Clearance

The contractor must ensure that its employees have appropriate medical clearance when required either by governmental regulations. Copies of medical clearance for contractor personnel are required to be presented as specified by the contract.

8.9 Incident Reporting

HSE Committee will participate with contractors in the investigations of incidents resulting in injury/illness and/or damage or loss of government property and also near misses.

8.10 Safety and Personal Protective Equipment

Unless otherwise specified, the contractor is responsible for providing all necessary safety and personal protective equipment needed by its employees. This equipment should be in good working order.

The contractor shall ensure that its employees have received appropriate training on the use and maintenance of safety and personal protective equipment prior to its use. Failure to correctly use appropriate safety equipment is a violation of the contract and may result in default of the contract.

8.11 Documentation

The contractor must provide MACE with documentation of all required training, medical exams, permits, material safety data sheets (MSDS), etc., for his or her employees or operations at the pre-construction meeting.

9.0 Office Safety

- 9.1 Office-Related Illness and Injury
- 9.2 Workstation Ergonomics
- 9.3 Indoor Air Quality and Ventilation
- 9.4 Noise
- 9.5 Office Electrical Safety
- 9.6 Office Fire Prevention Strategies
- 9.7 Break Areas

9.1 Office-Related Illness and Injury

A. Falls

Falls are the most common office accident, accounting for the greatest number of disabling injuries. The following checklist can help stop a fall before it happens.

- Be sure the pathway is clear before you walk.
- Close drawers completely after every use.
- Avoid excessive bending, twisting, and leaning backward while seated.
- Secure electrical cords and wires away from walkways.
- Always use a stepladder for overhead reaching. Chairs should never be used as ladders.
- Clean up spills immediately.
- Pick up objects co-workers may have left on the floor.
- Report loose carpeting or damaged flooring.
- Never carry anything that obscures your vision.
- Wear stable shoes with non-slip soles.

B. Strains and Overexertion

Before you pick up a carton or load, ask yourself these questions:

- Is this too heavy for me to lift and carry alone?
- How high do I have to lift it?
- How far do I have to carry it?

If you feel that the lift is beyond your ability, contact your supervisor or ask another employee to assist you.

Safe Lifting Steps

- Take a balanced stance feet placed shoulder-width apart. When lifting something from the floor, squat close to the load.

- Keep your back in its neutral or straight position. Tuck in your chin so your head and neck continue the straight back line.
- Grip the object with your whole hand, rather than only with your fingers.
- Draw the object close to you, holding your elbows close to your body to keep the load and your body weight centered.
- Lift by straightening your legs. Let your leg muscles, not your back muscles, do the work. Tighten your stomach muscles to help support your back. Maintain your neutral back position as you lift.
- Never twist when lifting. When you must turn with a load, turn your whole body, feet first.
- Never carry a load that blocks your vision.
- To set something down, use the same body mechanics designed for lifting.

Ergonomic Solutions to Backbreaking Tasks

If you are doing a lot of twisting while lifting, try to rearrange the space to avoid this.

Rotate through tasks so that periods of standing alternate with moving or sitting. Ask for stools or footrests for stationary jobs.

Store materials at knee level whenever possible instead of on the floor. Make shelves shallower (12-18") so one does not have to reach forward to lift the object. Break up loads so each weighs less.

C. Struck By or Striking Objects

Striking against objects is another cause of office injuries. Incidents of this type include:

- Bumping into doors, desks, file cabinets, and open drawers.
- Bumping into other people while walking.
- Striking open file drawers while bending down or straightening up.
- Striking against sharp objects such as office machines, spindle files, staples, and pins.

Pay attention to where you are walking at all times, properly store materials in your work area and never carry objects that prevent you from seeing ahead of you.

D. Caught In or Between Objects

The last category of leading disabling incidents occurs as a result of office workers who get their fingers or articles of clothing caught in or between objects. Office workers may be injured as a result of:

- Fingers caught in a drawer, door, or window.
- Fingers, hair or articles of clothing and jewellery caught in office machines.
- Fingers caught under the knife-edge of a paper cutter.

- While working on office equipment, concentrate on what you are doing.
- *Material Storage*

Office materials that are improperly stored can lead to objects falling on workers, poor visibility, and create a fire hazard. A good housekeeping program will reduce or eliminate hazards associated with improper storage of materials. The following are good storage practices:

- Boxes, papers, and other materials should not be stored on top of lockers or file cabinets because they can cause landslide problems. Boxes and cartons should all be of uniform size in any pile or stack. Always stack material in such a way that it will not fall over.
- Store heavy objects on lower shelves.
- Try to store materials inside cabinets, files, and lockers.
- Office equipment such as typewriters, index files, lights or calculators should not be placed on the edges of a desk, filing cabinet, or table.
- Aisles, corners, and passageways must remain unobstructed. There should be no stacking of materials in these areas.
- Storage areas should be designated and used only for that purpose. Store heavy materials so you do not have to reach across something to retrieve them.
- Fire equipment, extinguishers, fire door exits, and sprinkler heads should remain unobstructed. Materials should be at least 18 inches minimum away from sprinkler heads.

9.2 Workstation Ergonomics

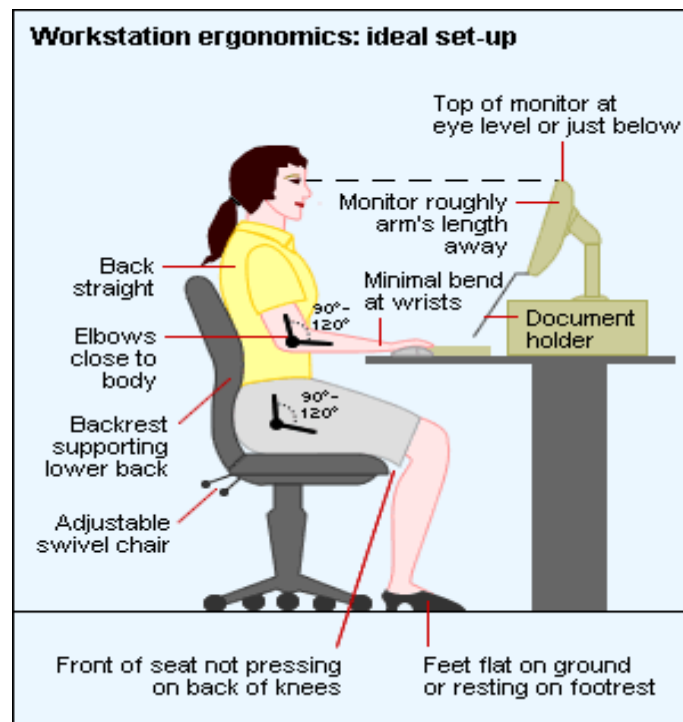
Ergonomics means fitting the workplace to the workers by modifying or redesigning the job, workstation, tool or environment. Workstation design can have a big impact on office workers health and well-being.

The key to comfort is in maintaining the body in a relaxed, neutral position. The ideal work position is to have the arms hanging relaxed from the shoulders. If a keyboard is used, arms should be bent at right angles at the elbow, with the hands held in a straight line with forearms and elbows close to the body. The head should be in lined with the body and slightly forward.

Arranging Your Workstation to Fit You

- Adjust the height of the chair's seat such that the thighs are horizontal while the feet are flat on the floor.
- Adjust the seat pan depth such that your back is supported by the chair back rest while the back of the knee is comfortable relative to the front of the seat.
- Adjust the back rest vertically so that it supports/fits the curvature of your lower back.

- With the arms at your sides and the elbow joint approximately 90 degrees, adjust the height/position of the chair armrests to support the forearms.
- Adjust the height of the keyboard such that the fingers rest on the keyboard home row when the arm is to the side, elbow at 90 degrees, and the wrist straight.
- Place the mouse, trackball, or special keypads, next to the keyboard tray. Keep the wrist in a neutral position with the arm and hand close to the body. Adjust the height of the monitor such that the top of the screen is at eye level.
- Place reference documents on a document holder close to the screen and at the same distance from the eye.
- A footrest may be necessary if the operator cannot rest his/her feet comfortably on the floor.

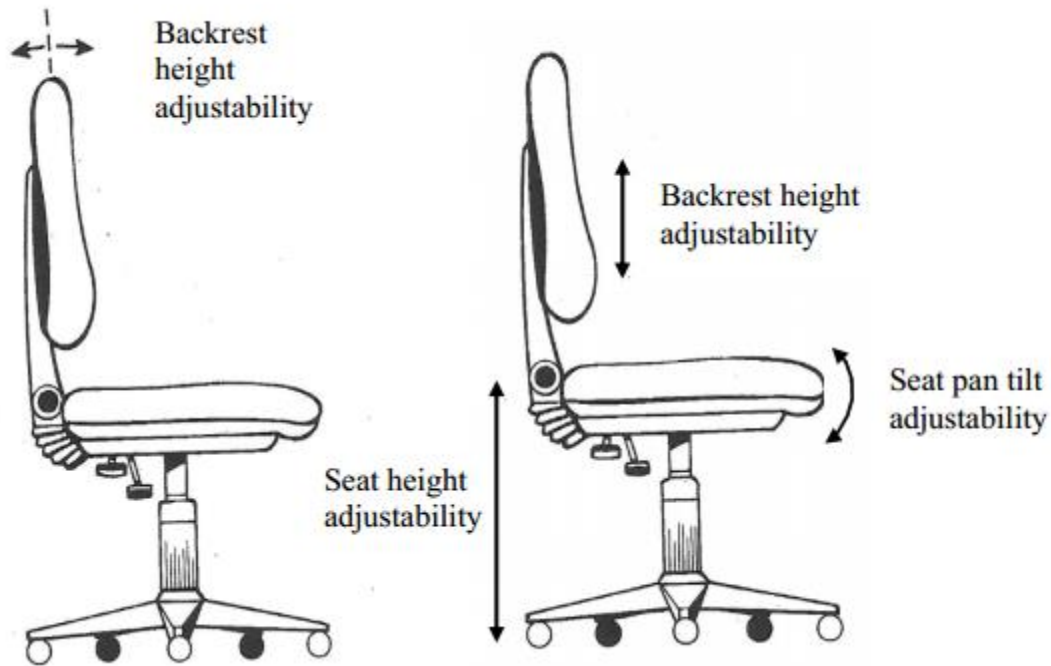


Poor workplace design and layout can contribute to workplace injuries and illness while correct chair height, adequate equipment spacing and good desk posture can help an individual stay comfortable.

Here are some ergonomic factors to consider when setting up or adjusting your workspace.

Chair

Ideally, use a swivel chair that has 5 feet. Castor wheels should be fitted if the chair is on carpet. On a smooth surface, however, as castors are too unstable, the chair should be fitted with glides (flattened smooth egg-shaped feet). Adjust the height of your chair so that your feet rest comfortably on the floor. If this makes your chair too low in relation to the desk, use a footrest and raise the chair up to the desired height.

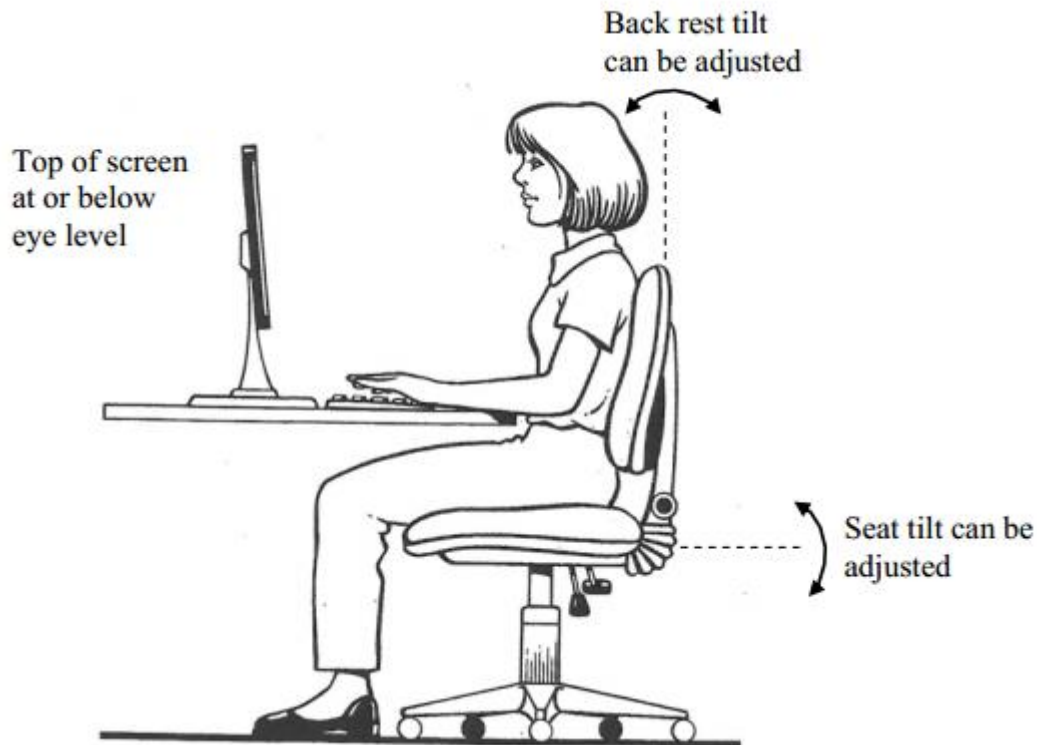


Correctly adjusting your chair can help you maintain proper posture and take the pressure off your back. When sitting, your knees should be about level with your hips, and the seat of your chair should not press into the back of your knees. Your backbone should be straight and your shoulders back. If your chair can't be adjusted so that your back is straight, place a cushion between the curve of your lower back and the back of the chair.

Monitor

The monitor should be roughly an arm's length away. The top of the screen should be at eye level or just below so that you look down at a slight angle to your work.

People who wear bifocals tend to look through the bottom part of the lenses to view the monitor. This makes them tilt their head backwards, which can fatigue the muscles supporting the head. If you wear bifocals, there are several ways to address this problem.



- Position the monitor lower than normal to compensate for needing to look through the bottom of your lenses.
- Raise your chair until you can view the monitor without tilting your head back. This may mean that you have to raise the keyboard and use a footrest.
- When working at the computer, use a pair of single-vision lenses with a focal length designed for computer work.

To avoid glare and reflections, neither you nor the monitor should directly face the window. If your screen is reflecting the light, it's worth experimenting with the overhead lights and window blinds to reduce these reflections. Tilting the monitor slightly downwards can help with this. You should also adjust the monitor's brightness to a comfortable level.

Even with these adjustments, your eye muscles can become tired when you do a lot of close work. Remember to rest them every 10 minutes or so by looking away into the distance.

Desk

Your desk area should be deep enough to accommodate your monitor at the appropriate distance and to place the things you use most often directly in front of you. Make sure everything you need is within reach so that you don't have to stretch for things. Stand up to get items that are further away.

A desk with a matte surface helps minimise glare.

Keyboard

You should be able to have your forearms close to horizontal and your wrists straight when using the keyboard. This means that your hands should not be bent up, down or to either side

in relation to your forearms. Your elbows should be close to your body. The keyboard should be aligned with the monitor and directly in front of you so that you don't have to twist or rotate to use it.

Put reference documents either between the monitor and the keyboard or directly alongside the screen in a document holder. Putting such documents between the keyboard and the front of the desk pushes the keyboard too far back on the desk, disrupting your posture. However, the keyboard should not be so far towards you that your wrists rest on the sharp edge of the desk.

If it feels comfortable, you should lower the feet at the rear of the keyboard as this reduces the height and angle of the keyboard, which helps avoid load on the shoulders and wrists.

Wrist rests

If your workstation has been set up properly, a wrist rest should not be needed. If you do use one, make sure that you only use it when pausing between typing rather than actually keying, to avoid strain on the wrists.

Mouse

The mouse should fit the size of your hand so that it is comfortable to work with. Your wrist should be in a neutral position (minimal bend in any direction at the wrist) when you use the mouse, and your fingers should be able to rest on the push buttons between actions. It's also a good idea to position the mouse on the desk so that the weight of your arm is supported by the desk.

Make sure the mouse is alongside the keyboard and try to keep your wrist in a natural and comfortable position when using the mouse. If an activity primarily involves the mouse rather than the keyboard, bring the mouse in front of the keyboard. This helps minimise discomfort by ensuring your elbow remains close to your body and your arm is not under strain while you use the mouse.

Other ways to help take the strain out of activities in which you are using the mouse a great deal are to use keyboard shortcuts rather than using the mouse and to change your mouse hand from time to time.

Phone

Position the phone so that you can perform simple tasks such as taking notes without twisting or cradling the phone on your shoulder. This means that the cord must be long enough. If you are using the phone frequently in your work, or if you need to do other tasks such as keying information at the same time as using the phone, a headset is recommended.

Laptop computers and notebooks

Laptops were designed for short term or mobile use; however, this portability means that people often use them at an unsuitable work height. Because the screen and keyboard are hard to adjust, you may have to hold your arms too high or bend your neck to see the screen. This may result in discomfort over a long period. There are several ways to address these problems.

- Dock the laptop into a desktop computer at a suitable workstation.
- Connect the laptop to stand-alone equipment such as a separate screen, keyboard and mouse.
- Transfer information onto a desktop computer if working for long periods.
- When using a laptop, be aware of your posture and break up keying with other activities.
- Become keyboard literate so that you don't have to look down at the keys — this helps reduce strain on the neck.

Posture, Movement and Stretching

Change your posture frequently to minimise fatigue. It's a good idea to take short, frequent breaks in which you move around, and to mix up your tasks during the day. This encourages body movement and use of different muscle groups. Stretching your neck, shoulders, wrists, back and ankles is also recommended several times each working day.

9.3 Indoor Air Quality and Ventilation

The College Administration shares a strong belief that there is a direct correlation between employee health and the quality of their work environment. Indoor Air Quality (IAQ) has proven to be a major component in providing a quality work environment.

Many times odours are associated with chemical contaminants from inside or outside the office space, or from the building fabric. This is particularly noticeable following building renovation or installation of new carpeting. Out-gassing from such things as paints, adhesives, sealants, office furniture, carpeting, and vinyl wall coverings is the source of a variety of irritant compounds. In most cases, these chemical contaminants can be measured at levels above ambient (normal background) but far below any existing occupational evaluation criteria.

Indoor Air Pollution

An inadequately ventilated office environment or a poorly designed ventilation system can lead to the build up of a variety of indoor air pollutants.

Controls to Prevent Indoor Air Pollution

The following recommendations and guidelines are useful in preventing indoor air quality problems:

1. HVAC systems should receive periodic cleaning and filters should be changed on a regular basis on all ventilation systems.
2. The ventilation system should introduce an adequate supply of fresh outside air into the office and capture and vent point air pollutant sources to the outside.

3. Office machinery should be operated in well-ventilated areas. Most office machinery does not require local exhaust ventilation in areas that are already provided with 7-10 air changes per hour. Photocopiers should be placed away from workers' desks.
4. Office equipment should be cleaned/maintained according to the manufacturer's recommendations. Properly maintained equipment will not generate unhealthy levels of pollutants.
5. Special attention should be given to special operations that may generate air contaminants (such as painting, pesticide spraying, and heavy cleaning).

Lighting

Lighting is one of the most important factors affecting personal comfort on the job. The best lighting system is one in which the light level is geared to the task, where brightness ratios are controlled (no intensely bright or dark areas in one field of vision) and where ceilings, walls, and floors are carefully chosen to minimize glare.

Vision problems are one of the leading sources of complaints among office workers. Poor office lighting can cause eye strain and irritation, fatigue, double vision, watering and reddening of the eyelids, and a decrease in the power of focus and visual acuity. Headaches as well as neck and back pains may occur as a result of workers straining to see small or detailed items. Poor lighting in the workplace is also associated with an increase in accidents.

There are a number of measures that can be used to prevent and control poor lighting conditions in the work environment:

1. Regular maintenance of the lighting system should be carried out to clean or replace old bulbs and faulty lamp circuits.
2. A light-colour matte finish on walls, ceilings, and floors to reduce glare is recommended
3. Whenever possible, office workers should not face windows, unshielded lamps, or other sources of glare.
4. Adjustable shades should be used if workers face a window.
5. Diffuse light will help reduce shadows. Indirect lighting and task lighting are recommended, especially when work spaces are separated by dividers.
6. Task lamps are very effective in supplementing general office lighting for those who require or prefer additional lighting. Some task lamps permit several light levels.

9.4 Noise

When employees are subjected to sound levels exceeding standards, feasible administrative or engineering controls must be utilized. If such controls fail to reduce sound levels, personal protective equipment must be provided and used to reduce sound levels.

For many of the annoying sounds in the office environment, the following measures are useful for reducing the level of noise or its effects:

1. Select the quietest equipment if possible.
2. Provide for proper maintenance of equipment, such as lubrication and tightening of loose parts that can cause noise.
3. Locate loud equipment in areas where its effects are less detrimental.
4. Use barrier walls or dividers to isolate noise sources. Use of buffers or acoustically-treated materials can absorb noise that might otherwise travel further.
5. Schedule noisy tasks at times when it will have less of an effect on the other tasks in the office.

9.5 Office Electrical Safety

Electricity is essential to the operations of a modern automated office as a source of power. Electrical equipment used in an office is potentially hazardous and can cause serious shock and burn injuries if improperly used or maintained.

Types of electrical hazards found in an office environment include the following:

Ungrounded Equipment

Grounding is a method of protecting employees from electric shock. By grounding an electrical system, a low-resistance path to earth through a ground connection is intentionally created. Most fixed equipment such as large, stationary machines must be grounded. Cord and plug connected equipment must be grounded if it is located in hazardous or wet locations, if operated at more than 150 volts to ground, or if it is of a certain type of equipment (such as refrigerators and air conditioners). Smaller office equipment, such as typewriters and coffee pots, would generally not fall into these categories and therefore would not have to be grounded. However much of the newer office equipment is manufactured with grounded plugs as a precaution (three prong plugs). In such cases, the equipment should be used in accordance with the manufacturer's instructions. In any case, never remove the third (grounding) prong from any three-prong piece of equipment.

Overloaded Outlets

Insufficient or overloading of electrical outlets should be avoided. A sufficient number of outlets will eliminate the need for extension cords. Overloading electrical circuits and extension cords can result in a fire. Floor mounted outlets should be carefully placed to prevent tripping hazards.

Unsafe/Non-Approved Equipment

The use of poorly maintained or unsafe, poor quality, non-approved (by national testing laboratory) coffee makers, radios, lamps, space heaters, etc. (often provided by or used by employees) should be discarded. Such appliances can develop electrical shorts creating fire and/or shock hazards. Equipment and cords should be inspected regularly, and a qualified individual should make repairs. Defective, frayed or improperly installed cords for electrically-operated office equipment

Improper Placement of Cords

A cord should not be pulled or dragged over nails, hooks, or other sharp objects that may cause cuts in the insulation. In addition, cords should never be placed on radiators, steam pipes, walls, and windows. Particular attention should be placed on connections behind furniture, since files and bookcases may be pushed tightly against electric outlets, severely bending the cord at the plug.

A proper wall plug should be used for an electrical appliance that will be plugged in to a wall socket. Using bare wires directly on the wall socket is strictly forbidden. This is one of the principal contributors of office fire hazards.

Electrical Cords across Walkways and Work Areas

An adequate number of outlet sockets should be provided. Extension cords should only be used in situations where fixed wiring is not feasible. However, if it is necessary to use an extension cord, never run it across walkways or aisles due to the potential tripping hazard. If you must run a cord across a walkway, either tape it down or purchase a cord runner.

Live Parts Unguarded

Wall receptacles should be designed and installed so that no current-carrying parts will be exposed, and outlet plates should be kept tight to eliminate the possibility of shock.

Pulling of Plugs to Shut Off Power

Switches to turn on and off equipment should be provided, either in the equipment or in the cords, so that it is not necessary to pull the plugs to shut off the power. To remove a plug from an outlet, take a firm grip on and pull the plug itself. Never pull a plug out by the cord.

Working on "Live Equipment"

Disconnect electrical machines before cleaning, adjusting, or applying flammable solutions. If a guard is removed to clean or repair parts, replace it before testing the equipment and returning the machine to service.

Blocking Electrical Panel Doors

If an electrical malfunction should occur, the panel door, and anything else in front of the door will become very hot. Electrical panel doors should always be kept closed, to prevent "electrical flashover" in the event of an electrical malfunction.

9.6 Office Fire Prevention Strategies

The best time to think about fire safety is before a fire starts. Learn the location of fire escape routes and how to activate the fire alarm. Participate in practice fire drills on a regular basis. Become familiar with stairway exits - elevators may not function during a fire, or may expose passengers to heat, gas and smoke.

- Heat-producing equipment – space heaters, copiers, work processors, coffee makers and hot plates - are often overlooked as a potential fire hazard. Keep them away from anything that might burn. (only EH&S approved space heaters can be used)
- Electrical appliances can be fire hazards. Be sure to turn off all appliances at the end of the day. Use only grounded appliances plugged into grounded outlets (three prong plug).
- If electrical equipment malfunctions or gives off a strange odour, disconnect it and call the appropriate maintenance personnel. Promptly disconnect and replace cracked, frayed, or broken electrical cords.
- Keep extension cords clear of doorways and other areas where they can be stepped on or chafed and never plug one extension cord into another.
- Do not allow combustible material (boxes, paper, etc.) to build up in inappropriate storage locations (near sources of ignition).

9.7 Break Areas

The college break rooms are available for employees, staff and students. Items specifically prohibited in break rooms include:

- Heat-producing electrical appliances are not permitted in offices or break rooms. This includes toaster ovens, griddles, George Foreman Grills, or hot plates.
- Alcohol lamps, oil lamps, fireworks, flammable or combustible materials such as gasoline, kerosene, lighter fluid, charcoal products, or similar substances are not permitted in any break room.

- Candles & incense are not permitted anywhere on campus. If a candle cannot be easily removed from its holder/container/receptacle, all parts will be confiscated and disposed of.
- No Barbeque pits, grills, camp stoves, or open flame appliances are permitted.
- Fryers or hot oil containing cookers are strictly prohibited.

The Specific items that are allowed in break rooms include:

- Coffee makers with a thermostat and in line fuse
- Iced tea makers with a thermostat and in line fuse
- Hot air popper with a thermostat and in line fuse, no reservoir for heating butter or margarine
- Tea kettle with a thermostat and in line fuse and a restricted spout opening
- Microwaves
- Refrigerators

10. Medical Emergency

Personal injury is not common in laboratories. These injuries are usually minor cuts or burns but can be severe as acute effects of chemical exposure or accidents such as heart attacks or strokes. Prevention of injuries should be a major emphasis of any laboratory safety program. Proper training will help prevent injuries from glassware, toxic chemicals, burns and electric shock

In the event of personal injury, the initial responsibility with the first aid rests with the first person(s) at the scene, who should act quickly but in a calm and reassuring manner. The person assuming responsibility should:

- Immediately call for medical help. Call 108 for medical emergencies
- Be explicit in reporting suspected types of injuries or illness, location of victim and type of assistance required
- Send someone to meet the ambulance crew at likely entrance of the building
- Do not move the injured person except when necessary to prevent further injury

⇒ **The following details should be posted in each laboratory:**

- **The name(s) of person(s) with telephone number in the area trained in CPR (Cardio Pulmonary Resuscitation) and First Aid**
- **Telephone numbers for medical emergency(108)**
- **Location of the first aid box**
- **A quick escape route to a safe assemble point/ location where vehicles will be available as the situation demands**

10.1 General First Aid

1. First aid equipments should be readily available in each laboratory
2. Following any first aid, a nurse or a physician qualified to handle medical emergencies should provide further examination and treatment. The location and phone numbers of medical emergency services should be clearly posted
3. Each department should have at least one person trained in basic first aid and CPR
4. Minor injuries requiring first aid should always be reported to a supervisor and recorded reasons for this are as follows:
 - A minor injury may indicate a hazardous situation that should be corrected to prevent a serious future injury
 - It is important to document a minor injury as having been “work related” if the injury later leads to serious complications, such as from an infected cut

10.2 Personal Protection during First Aid

1. Persons responding to a medical emergency should be protected from exposure to blood and other potentially infectious materials. Protection can be achieved through adherence to work practices designed to minimize or eliminate exposure and through the use of personal protective equipment (gloves, masks, protective clothing etc.), which provide a barrier between the worker and the exposure source. For most situations in which first aid is given, the following guidelines should be adequate.
 - For bleeding control with minimal bleeding and for handling and cleaning instruments with microbial contamination, disposable gloves alone should be sufficient.
 - For bleeding control with excessive blood, disposable gloves, a coat, a mask and protective eye-wear are recommended
 - For measuring temperature and blood pressure, no protection is required
2. After emergency care has been administered, hands and other skin surfaces should be washed immediately and thoroughly with warm water and soap if contaminated with blood, other body fluids to which universal precautions apply, or potentially contaminated articles. Hands should always be washed after gloves are removed, even if the gloves appear to be intact.

11. Institute Safety Guidelines

For the sake of simplicity and easy understanding, the entire college campus has been split into following areas. Guidelines for safety in these areas are mentioned, however, be aware that all the instructions mentioned in general are applicable to these areas as well.

- Laboratory
- Classrooms
- Staff Rooms
- Conference Room
- Seminar Hall
- Corridors
- Elevators
- Roads
- Play Ground
- UPS Room
- General Areas
- Toilets

11.1 Guidelines for safety in Laboratory

MACE offers these suggestions for improving laboratory safety. Having an understanding of inherent hazards and learning how to be safe should be an integral and important part of the education process.

The lab in charge and faculty using the lab should ensure safe practices in our laboratories have adopted the following guidelines. They will be consistently enforced. Non-compliance by any student will result in suspension from the laboratory.

- Personal Safety
- General Laboratory Safety
- Electrical Safety
- Chemical Safety
- Mechanical Safety
- Other Laboratory Safety Links

Personal Safety

- Know the location of the nearest telephone. The emergency numbers should be displayed near the telephone.
- Horseplay or other acts of carelessness are prohibited.
- Perform no unauthorized experiments, tasks or job and perform given experiments, tasks or job only according to directions.
- Never work in a laboratory alone or at least without another person within easy call.
- Smoking is not allowed in any indoor area.
- Wear safety glasses or face shields when working with hazardous materials and/or equipment.
- Wear gloves when using any hazardous or toxic agent. They should be removed before leaving the lab, using telephones, opening refrigerators, or entering common areas.
- Clothing: When handling dangerous substances, wear gloves, laboratory coats, and safety shield or glasses. Shorts and sandals should not be worn in the lab. Shoes are required when working near machinery.
- Do not use any equipment unless you are trained and approved as a user by your Professor or Instructor.
- Wash hands before leaving the lab and before eating.
- Consumption of food or beverages in the laboratory is forbidden. Food may not be stored in refrigerators located in a laboratory.
- Tie back medium length and long hair when working near flames or entangling equipment.
- All accidents, no matter how minor, should be reported to the faculty/staff member supervising the laboratory
- Know the location of all safety equipment (e.g. eyewash, fire extinguisher, fire blanket, spill kit) and how to use them.
- Incident and Hazard Report Forms are also available through HSE Committee. Submitted reports will help alert Environmental Health and Safety to hazards on campus or unsafe work practices, and determine the frequency of accidents and/or injuries.

General Laboratory Safety

- Keep aisles clear.
- Maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, first aid kits and eyewashes.
- Do not use corridors for storage or work areas.
- Do not operate machines beyond their safe limits as specified by the manufacturer

- Devote at least three hours per semester, preferably in the first day of each lab, for training the students on various aspects of safety (Do's and Don'ts, potential hazards, first aid etc.) This should be conducted in the lab itself and ensure all students are properly informed.
- Do not operate machines/devices if you are physically unfit
- If leaving a lab unattended, turn off all ignition sources and lock the doors.
- Do not store heavy items above table height. Any overhead storage of supplies on top of cabinets should be limited to lightweight items only. Also, remember that a 36" diameter area around all fire sprinkler heads must be kept clear at all times.
- Spills (Oils, water etc.) should be cleaned up immediately.
- Be careful when lifting heavy objects. Lift comfortably, avoid unnecessary bending, twisting, reaching out, excessive weights, lift gradually and keep in good physical shape.

Electrical Safety

- Electrical equipment must be GFI-protected (i.e. "grounded") when used near any water source. If water or fluid is spilled in or around electrical equipment, FIRST shut off circuit breaker, then unplug the equipment before cleaning up the spill.
- Maintain a 36" unobstructed access to all electrical panels.
- Avoid using extension cords whenever possible. If you must use one, obtain a heavy-duty one that is electrically grounded, with its own fuse, and install it safely. Extension cords should not go under doors, across aisles, be hung from the ceiling, or plugged into other extension cords.

Mechanical Safety

- When using compressed air, use only approved nozzles and never direct the air towards any person.
- Guards on machinery must be in place during operation.
- Exercise care when working with or near hydraulically- or pneumatically-driven equipment. Sudden or unexpected motion can inflict serious injury.
- Thermal equipment (such as heat engines, heat transfer devices etc.) should be properly insulated

11.1.1 Safety precautions in different labs

i) ELECTRICAL MACHINES LAB

1. Understand the equipment to be tested and apparatus to be used.
2. Select proper type (i.e. AC/DC) and range of meters.
3. Do not touch live terminals or moving parts of the machine.
4. Do not leave wires which are not connected.
5. All the connections should be tight.
6. Get the connections checked by a staff member before switching 'ON' the supply.
7. Never exceed the permissible values of current, voltage and/or speed of any machine, apparatus, wire, load etc.
8. Switch on or switch off the load gradually and not suddenly.
9. Engaging the starter handle (for dc machines) and changing of rheostat positions should also be done gradually and not suddenly.
10. If power supply fails while an experiment is being carried out; turn off the circuit breaker immediately and bring back the experimental set up to its initial conditions before switching on the supply once again.

ii) CIVIL ENGINEERING LABS

1. Never enter lab without fully covered safety shoes.
2. Beware of hanging hair, loose shirt.
3. Do not use rings or watches while working.
4. Keep the floor neat & tidy, the floor must be free from oil and grease.
5. Do not operate any machine without the knowledge of its mechanism.
6. Do not play with any lever or any part of the machine.
7. Do not operate any tool or machine without the permission of staff in charge.
8. When you switch off a machine, do not leave before it has stopped running completely.
9. Beware of electrical hazards.
10. Guards on machinery must be in place during operation

iii) ELECTRONICS LAB

Following proper safety practices are a must when working with electronic equipment. Not only is there the danger of electrical shock, but the components can explode if not connected properly. Many of today's electronic components are easily damaged by improper handling. The test equipment used in the electronic service industry is expensive and easily damaged if proper operating procedures are not followed.

1. NEVER damage or tamper the EQUIPMENTS or LEADS.

2. INSPECT laboratory equipment for visible DAMAGE before using it
3. ALWAYS wear your SAFETY GLASSES.
4. KEEP soldering irons in their protective STAND when not in use.
5. Always CUT wire LEADS so the clipped wire falls on the table top and not toward others.
6. DO NOT TOUCH the tip end of a soldering iron to check for heat.
7. TURN OFF your soldering iron if it is unlikely to be used for more than 10 MINUTES
8. AVOID an EARTH GROUND when working with AC powered units.
9. ONLY work with powered units WHEN NECESSARY for troubleshooting.
10. NEVER strip insulation from a wire with your TEETH or a KNIFE, always use an APPROPRIATE wire stripping tool.
11. SHIELD wire with your hands when cutting it with a pliers to prevent bits of wire flying about the bench.
12. Avoid PINCHING wires when putting equipment back together.
13. Use a HEAT SINK when soldering temperature-sensitive components.
14. NEVER SOLDER a circuit that has the power applied.
15. DOUBLE CHECK circuits for proper connections and polarity prior to applying the POWER.
16. Observe POLARITY when connecting polarized components or test equipment into a circuit.
17. Make sure TEST instruments are set for proper FUNCTION AND RANGE prior to taking a measurement.
18. When measuring UNCERTAIN quantities, start with the range switch on the HIGHEST setting.
20. Apply HEAT from a soldering pencil for not more than a couple of seconds to AVOID HEAT DAMAGE.
21. Keep the INTENSITY on oscilloscopes as LOW as possible when in use and all the way down when not in use to avoid burning out the screen.
22. Always OBSERVE POLARITY when connecting components into a circuit, especially with electrolytic capacitors.

iv) COMPUTER LAB

1. Report fires or accidents to your lecturer/laboratory technician immediately.
2. Report any broken plugs or exposed electrical wires to your lecturer/laboratory technician immediately.
3. Turn off the machine once you are done using it
4. Avoid stepping on electrical wires or any other computer cables.
5. Do not open the system unit casing or monitor casing. Do not insert metal objects such as clips, pins and needles into the computer casings. They may cause fire.
6. Do not remove anything from the computer laboratory without permission.
7. Do not touch, connect or disconnect any plug or cable without your lecturer/laboratory technician's permission.
8. Ensure that the temperature in the room stays cool, since there are a lot of machines inside a lab as these can overheat easily. This is one of the many ways of ensuring computer safety.
9. Try not to touch any of the circuit boards and power sockets when a device is connected to them and switched on.

v) MECHANICAL LAB

1. Safety glasses must be worn during any cutting, grinding, chipping or sawing operations on all materials such as concrete, ferrous and non-ferrous metals and alloys, ceramics, plastics, wood, etc. In addition, splash goggles and face guards must be worn if there is a possibility of a liquid jet erupting, or solid debris flying, or intense heat radiation.
2. Shoes must completely cover the foot. No sandals are allowed.
3. Dress properly during all laboratory activities. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured.
4. If any laboratory equipment is malfunctioning, making strange noises, sparking, smoking, or smells "funny," Get an instructor or staff immediately. It is imperative that the instructor or staff knows of any equipment problems.
5. Keep aisles clear and maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, and eyewashes.
6. Avoid using extension cords whenever possible. Extension cords should not go under doors, across aisles, be hung from the ceiling, or plugged into other extension cords.
7. When using compressed air, use only approved nozzles and never directs the air towards any person.
8. Guards on machinery must be in place during operation.
9. Exercise care when working with or near hydraulically- or pneumatically-driven equipment. Sudden or unexpected motion can inflict serious injury.
10. Flammable chemicals must be stored in an Approved Flammable Storage Cabinet

11. All pressurized containers (e.g. gas cylinders) will be secured with two welded link chains and label all ingredients to show nature and degree of hazard.
12. Unless otherwise instructed, return all tools, equipment and unused specimens to the designated area or person, switch off equipment and pull plugs from electrical outlets.
13. Use tongs, grips, holders, etc. for placing specimens and work pieces into hot, or potentially dangerous equipment.
14. Appropriate gloves must be worn when working with corrosive fluids, hot furnaces, sharp objects, etc. Safety hats must be worn when there is a chance of objects falling, or cutting or bruising your head on projectiles. Protective footwear must be worn in all labs and machine shop areas.
15. If carrying out arc welding, any exposed skin should be covered to prevent burns from radiation. A leather apron should be worn, when appropriate, to prevent burns from metal splatter.
16. While operating engines, operate within the speed and load specified by the lab-in-charge. Never touch any hot exposed parts of the engine or equipment. While doing cranking the engine/operating any rotating part, don't wear bangles, watches etc

11.2 Guidelines for Classroom & Staff Room Safety

- Ensure that the internal flooring is in a good condition. Any safety concern may be brought to the attention of the staff advisor/HOD/Safety Co-ordinator
- Keep the gangways between desks clear and unobstructed
- Trailing electrical leads/cables should be prevented wherever possible
- Ensure that lighting bright enough to allow safe access and exit
- Follow procedures in place to deal with spillages
- Ensure that access steps or ramps are properly maintained and that access stairs or ramps are provided with handrails. Any non-conformance with this may be brought to the attention of the concerned faculty immediately.
- Ensure that permanent fixtures are in good condition and securely fastened, e.g. cupboards, display boards, shelving etc.
- Ensure that the furniture is in good condition and suitable for the size of the user
- Portable equipment if any must be stable and set on a suitable trolley
- Ensure that trolleys have been provided for moving heavy objects like computers, printers etc.
- If you use computers as part of your job, follow workstation ergonomics
- Ensure that fixed electrical switches and plug sockets are in good and safe working conditions. Follow electrical safety guidelines mentioned religiously.
- Ensure that all plugs and cables are in good condition.
- For over head projectors, always use a remote. Never climb on a desk and manually switch on a projector.

- Ensure that all damaged electrical equipment are taken out of service or replaced. Any non-conformance may be brought to the attention of the concerned faculty
- If there are fire exit doors in the classroom, ensure that they are
 - unobstructed;
 - kept unlocked; and
 - easy to open from the inside
- Ensure that fire-fighting equipment is in place in the classroom and fire evacuation procedures clearly displayed
- Be aware of the evacuation drill, including arrangements for any vulnerable adults or children
- Ensure that the room have natural ventilation

11.3 Guidelines for safety in Seminar Hall and Conference Halls

- Ensure that the furniture inside the hall properly placed and it is not obstructing the exit.
- The emergency exits should never be obstructed by anything
- Ensure that all electrical equipments are in order. Those equipments which are not in use must be stowed safely in proper cabinets
- Avoid the use of extension chords. If used, ensure that it is rated for heavy duty and is secured with a fuse of suitable rating
- Use remotes for switching ON and OFF the projectors. Never climb on a chair/desk and switch ON/OFF an OH projector
- Ensure that the volume of the PA system is adjusted to acceptable levels
- Ensure that “Emergency Exits” are clearly marked and well illuminated
- Ensure that the “Emergency Procedures” are clearly displayed at several places inside the hall
- If air conditioners are used, ensure that they are powered from suitable rated power plugs
- Cable dressing should be proper. Avoid loose running cables (power or signal) on the floors. Use cable tray if necessary.
- Any spills of any kind must be wiped off immediately. Ensure that the floor of the hall is dry and clean.
- Ensure that First Aid boxes are installed in all the halls having a seating capacity more than 50
- Ensure that sufficient numbers of fire extinguishers are installed inside the halls. The method of operation of them also must be clearly displayed.
- Smoking is strictly prohibited inside air conditioned rooms. MACE throughout its campus follows No-Smoking Policy

11.4 Guidelines for Road Safety inside MACE

- The owner of a vehicle is responsible for the vehicle at all times.
- Driving regulations are in effect at all times.
- The campus speed limit is twenty (20) kilometres per hour for all motor vehicles unless otherwise marked. However, safe driving is the principal regulation.
- All operators of any motor vehicle must have a valid, up to date license and insurance
- The pedestrians have the right of way
- Park vehicles in the designated area only in an orderly manner

11.5 Guidelines for safety in Corridors and General Areas

- For corridors at their minimum widths, certain wall-mounted technologies and other items may be mounted on the walls as long as they don't project more than 6 inches from the wall, not exceed 36 inches in length, be separated by at least 48 inches from other projections, and be installed at least 40 inches or greater above the floor.
- Wall mounted items which reduce the corridor width below allowable limits would be permitted when "in-use". Such items shall be closed or retracted when the equipment is not in use or unattended for more than 30 minutes.
- Infection Control supply carts/cabinets and crash carts outside of a specific room are allowed in the corridor while the precautions are in effect.
- Hazardous materials are not to be placed in corridors. These materials include: explosives, oxidizers, flammable or combustible liquids, solids or gases, aerosols, poisons, toxins, hazardous chemicals, gas and cryogenic cylinders, radioactive materials (except those in use with a scintillation counter or film cassette in a locked freezer), equipment operating under either positive or negative pressure, high temperature or high voltage, equipment with exposed machine parts (i.e. unguarded belts, pulleys or gears), live animals, incubators, open shelving, and centrifuges.
- Recycle bins are permitted in corridors if they meet this corridor use guideline. Placement is restricted to items in use only. Storage of unused items is to be done elsewhere
- Construction materials may not be stored (even temporarily) in the corridor.
- Equipment scheduled for installation, supplies pending movement into labs or office space, surplus material or similar items are prohibited.
- Items are to be placed on one side of the corridor only. The selected side should be uniform throughout the floor/wing or area.
- Materials should be placed in such a manner to maintain a clear unobstructed working space of not less than 30 inches in width, 36 inches in depth and 78 inches in height in front of electrical service equipment. Where electrical service equipment is wider than

30 inches the working space shall not be less than the width of the equipment. No materials shall be stored within the designated working space.

- A minimum wall clearance of 18 inches is required on both sides of all fire protection equipment including fire extinguishers, pull boxes, fire hoses, around safety showers or eyewash stations, around utility cabinets and a clear, unobstructed path to them must be maintained.
- All exit doors including stairwell doors shall be clear of storage to a distance of 5 feet on either side of the door.
- No storage is allowed in a horizontal exit, stairwells or areas of refuge.
- A minimum wall clearance of 30 inches is required on both sides of electrical panels or disconnects, and a clear, unobstructed path to them must be maintained.
- No storage is allowed within 3 feet of an electrical cabinet. Liquids of any kind shall not be stored within 6 feet on both sides of electrical panels.
- Items requiring power must have a dedicated corridor receptacle near the item. Extension cords are not to be used.
- Workstations and "coffee break" areas are prohibited in corridors. Coffee makers and similar heating devices are prohibited.

11.6 Guidelines for safety in Play ground

- Never push or roughhouse on equipment.
- Leave bikes, backpacks and other items in a designated spot. Items left randomly around the playground can cause people to trip and fall.
- Never use equipment that is wet, because moisture causes the surface to be slippery.
- Don't wear clothes with drawstrings at the playground. They can get caught on equipment and pose a strangulation hazard.
- Play within the designated areas. Never use the equipments outside the ground limits
- Wear suitable sporting gears for safety
- Always wear a helmet to avoid injury to face and head
- In the event of an injury, give first aid (as explained in Chapter 10)
- If case the injury is serious and a possible medical emergency, call 108 and trained staff for first aid.

11.7 Guidelines for safety in Elevators

Check the posted capacity of elevators and not get onto an elevator that is already at capacity. Wait for the other elevator if the car is full or if there is not enough room to stand comfortably in the elevator cabin.

- Discourage unsafe behavior by others in and around elevators.

- Report elevator vandalism promptly to the EHS committee
- Report any elevator-related accidents promptly to the EHS committee
- Push the alarm button and as many floor buttons as possible if you suspect trouble or are attacked so that the elevator will stop quickly at the next floor. Don't get into an elevator with someone who makes you feel uneasy.
- Never interfere with closing doors. Wait for the next elevator.
- Don't attempt to pry open elevator doors.
- Cram into an elevator that is exceeding its capacity; actively discourage anyone else from cramming into an elevator.
- Block the doors open with any kind of equipment or box, or with your foot or arm. In newer elevators, holding the doors open will cause the elevator to "time out" and shut down as a safety feature. In that situation, a mechanic must reset the controller to re-start the elevator. Use the DOOR OPEN button on the floor selector panel to hold doors open longer than the normal timing sequence

11.8 Guidelines for safety in UPS room

- Battery racks and cabinets should be designed and installed to accommodate the weight and size of the batteries ordered and the quantity to be installed.
- Battery racks are required to be rigid and substantial and made of either metal that is covered with a corrosion-resistant material or nonconductive materials such as fibre glass.
- Preferably the battery room ceiling should be flat to ensure that the release of gases and fumes cannot be trapped in pockets.
- Battery rooms should be isolated from each other into fire compartmentalized rooms, away from each other and other equipment
- Individual battery rooms should be treated as separate zones for fire detection and suppression purposes.
- Carbon Dioxide portable fire extinguishers should be provided and accessible.
- All battery racks and cabinets associated with UPS systems should have NEC code green wire grounds linking all battery racks.
- Waterproof fixtures with flameproof construction are recommended and should be fixed to a wall or suspended more than 50 cm from the ceiling, but not directly above the batteries or charging units. Light fixture should be closed or sealed to prevent accumulation of gas.

- Battery rooms should be equipped with an Emergency Power Off (EPO) system that can disconnect power in the room from the UPS common battery buss or individual UPS module.
- The battery rooms should be designed with an adequate exhaust system, providing for continuous external ventilation of the battery room to prohibit the build-up of potentially harmful fumes and gas. Each battery room should have a hydrogen gas detection system to detect hydrogen gas build-up.
- Spill containment must be provided to adequately contain potential acid spills from cracked or leaking batteries. Adequate quantities of absorbent materials and acid neutralizing agent should be maintained in the room for use in spill containment and cleanup operations.
- Every battery room should have a combination eye wash/deluge shower station to provide a means of decontaminating personnel exposed to and contaminated by battery acid.
- Anyone working in and around batteries should wear eye protection and proper personal protection equipment (PPE).

11.9 Guidelines for safety in Toilets

- Grab bars should be installed for securing your balance. They are secured horizontally or vertically on the walls of the toilet. They assist in walking when the floor is wet. These bars become necessary to ensure safety for the elderly and children. Do not install these grab bars in a diagonal position, this will not support your weight, and hence will beat the entire purpose.
- Toilet seat locks may be used which is another safety feature that can be added to the bathroom.
- Keep the garbage bin under the wash basin so that it does not get in your way. Hazardous things like medications, discarded razor blades, cans of cleaning materials, etc, are thrown in the garbage cans should be removed on daily basis.
- Don't leave any electrical appliances anywhere close to the water. Also turn off the electricity and unplug the appliances, after using them, to prevent dangerous accidents.
- Install medical cabinets in toilets. Dispose off all the medication that has expired.
- Keep the cleaning supplies for bathroom cleaning, on a high shelf to keep it away from the users
- Keep a mop handy in the bathroom and dry the tiles after every time the bathroom is used. Avoid slippery floors. This will ensure that the number of accidents due to slipping on wet bathroom floor is minimized.

References

1. HSE Manual, BHEL Electronics Division, Mysore Road, Bangalore
2. HSE Manual, BHEL Trichy.
3. Institutional HSE Manual of Government Engineering College, Barton Hill, Trivandrum.

Annexures

Annexure 1 – Accident Reporting Form

Annexure 2 – Workstation Ergonomics Checklist

Annexure 3 – Safety Survey List (ELECTRICAL)

ANNEXURE 1

**ACCIDENT REPORTING FORM
(Including First Report of Injury)**

REPORT OF AN ACCIDENT

Please complete this form and forward it to the Head of the Department / Safety Co-ordinator within 3 days of the incident

Serious accidents should be reported to the HOD immediately over phone

Please use BLOCK CAPITALS

Part A – About the Incident

1. Date of Incident :
2. Time of Incident :
3. Where did the incident happen? (Give Dept, Building, Part of Building...etc)
4. Were there any witnesses? If yes, give details (Name, Designation, Department, Phone Number...etc)
5. Give as much detail as possible about the incident (use additional A4 sheets if necessary)

Part B – About Injured Person (Fill this section only if anyone was injured)

1. Full Name of the Injured :
2. Home Address & Telephone Number
3. Age :
4. Sex :
5. Detail of the injured person(s) (Designation, Department)
6. What was the injury? (Fracture, Burns, Laceration, Bruises, Minor wounds...etc)
7. What part of body was injured?
8. What First Aid was given?

**(Name, Designation and Signature of Person
reporting the incident, with date)**

ANNEXURE 2
WORKSTATION ERGONOMICS CHECKLIST

Workstation Ergonomics Checklist

Ideal response should be YES. If your response is NO, please read the suggestions given in column 3

Chair	Response - YES/NO	Suggestions if response is "NO"
1. Familiar with all chair adjustments		Try all adjustments to increase comfort. Locate user manual or check the web site of the chair manufacturer
2. Height is appropriate - feet are flat on the floor and thighs are somewhat parallel to ground		Raise or lower the chair so that hip, knees, thighs and feet are properly positioned If feet cannot be placed flat on the floor a footrest may be required
3. The low back is supported by the back of the chair		Check to see if the backrest can be raised up or down so that the low back has sufficient support.
4. Seat depth is adequate such that there is a little space between the calf and the seat		Check to see if the seat will slide in/out or the back will move in/out
5. Armrests can be adjusted so they are not in the way when keying		Check to see if the arms can be lowered or moved out of the way while keying
6. Casters are appropriate for the flooring (ie rubber casters for vinyl, concrete/hard wood floors)		Contact the chair vendor to replace the casters
Keyboard/Mouse	Response - YES/NO	Suggestions if response is "NO"
1. Keyboard and mouse height are about the same height as the elbows		Adjust the keyboard and mouse if on a tray to match elbow height or Adjust the chair so elbow height matches keyboard and mouse height (a footrest may be required to support the feet with chair)

		raised)
2. Keyboard and mouse are positioned directly in front of the body		Consider moving the computer or changing workstation configuration so that keyboard, monitor, and mouse are directly in front of the body
3. Mouse is as close to the keyboard as possible		Consider using a keyboard tray with room for the mouse or use a mouse bridge
4. Wrist rest is used only for resting palms of hands and is not used while keying		Remove the wrist rest and move keyboard to the edge of the work surface
Monitor	Response - YES/NO	Suggestions if response is "NO"
1. Top of screen is about the same height as the eyes		If the monitor adjusts - raise or lower it If the monitor does not adjust - raise by adding phone books, paper reams, or monitor risers - lower by removing items beneath the monitor * Note if wearing bifocals, the monitor should instead be as low as possible
2. Screen is about an arm's length away		Move monitor closer or Push monitor further back
3. Monitor is positioned directly in front of the individual		Position monitor directly in front Consider the use of a flat screen if space constraints do not allow proper monitor placement
4. Monitor is positioned so that it does not face or back up to a window		Move monitor so that it is angled 90 degrees from windows
5. The screen is clean		Periodically use a screen cleaner
Miscellaneous	Response - YES/NO	Suggestions if response is "NO"
1. Frequently used items (phone, calculator, reference		Move items so they are closer, request longer cords if this limits movement

books) are within easy reach		
2. Lighting is sufficient (low lighting in computer areas, brighter light for documents)		Reduce overhead lighting and supplement with small task lights

ANNEXURE 3
SAFETY SURVEY LIST (ELECTRICAL)

SAFETY SURVEY LIST (ELECTRICAL)

Department:	Lab-In-Charge:	Date:
Building:	Room #	Phone #

Description	Yes	No	NA	Comments
Have all electrical equipment are properly grounded?				
Whether all circuit breakers and fused circuits labelled to indicate whether they are in Open or Closed condition?				
Whether fuses of proper rating are used?				
Whether all live parts are earthed?				
Has permanent wiring used instead of extension cords?				
Whether electrical lines are not suspended unsupported across rooms or passageways?				
Whether cords routed properly, not kept running on floor?				
Whether cords placed in pathways?				
Whether cords placed under carpets, rugs or other heavy objects?				
Whether cords are run through holes in ceiling and walls or through doorways and windows?				
Are all electrical panels covered with proper faceplates to prevent exposure to live parts?				
Whether tools, appliances, instruments are in good working condition?				
Are Multiple plugs used?				



Handwritten signature

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