[Insert name of Department, School, Center or Institute]

Hazard Identification Algorithm

(HIA)

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Names

# ERGONOMIC and MECHANICAL HAZARDS

## Ergonomic Hazards

### Physical Stress

* 1. Does the process require frequent contact of fingers or wrists with sharp edges?
  2. Do hand tools or process equipment vibrate the hands, arms, or whole body?
  3. Are the researchers hands exposed to temperature less than 21o C (70 F)?

### Force

* 1. Does any routine aspect of procedure require more than 4.5 kg (10 lbs) of force?
  2. Does the procedure require using a pinch grip (between thumb and finger)?
  3. Are gloves used, increasing the force needed for motion of the fingers?
  4. Does the procedure require frequent heavy lifting (> 18 kg or 40 lb, 2 hours per day)?
  5. Does the procedure require occasional heavy lifting (> 23 kg or 50 lb)?
  6. Does the procedure require handling items that are difficult to grasp?
  7. Does the procedure require lifting objects > 2 m ( 6’)?

### Posture

* 1. Does the procedure require bending (up or down) of the wrist or rotating the wrist from side to side?
  2. Does the procedure require the combination of hand twisting and forceful griping like a "clothes wringing" motion?
  3. Does the procedure require extended reaches, beyond normal arm reach?
  4. Does the procedure require awkward lifts or carries that are near the floor, above the shoulders, or far in front of the body?
  5. Does the procedure require exertion of pushing, pulling, lifting, or lowering forces in awkward positions to the side, overhead, or at extended reaches?
  6. Is the researcher required to maintain the same posture, either sitting or standing, most of the time?

### Repetitiveness (Refer the Annexure I)

* 1. Does the procedure require that one motion pattern be repeated at a high frequency?
  2. Is the cycle time for repetitive operations less than 30 seconds?

### Workstation Hardware

* 1. Is the orientation of the work surface inconvenient for work and nonadjustable?
  2. Does the work surface appear to be too high or too low for many operators?
  3. Is the location of the research apparatus non-adjustable?
  4. Is the location of the tool in a confined space?

### Work Environment

* 1. Are housekeeping practices poor (e.g., aisles cluttered and waste on the floor)?
  2. Are floors uneven or slippery?
  3. Does the procedure require frequent (daily) use of stair or ladder climbing?
  4. Do the work tasks contain significant visual components, requiring good lighting?
  5. Does the work environment have too much or less light or any glare conditions?
  6. Does the researcher’s eye have to move periodically from dark to light areas?

## Mechanical Injury Hazards

1. Do the researchers wear any jewelry that could get caught on the projections, operating working surfaces and equipment such as rings, chain and watch while working in the laboratory?
2. Is there any equipment where a shearing is likely to occur? e.g. powered metal or automated paper cutter
3. Is there a possibility to get hurt by falling from an elevated position?
4. Is there a possibility to get oneself hurt by the impact of moving equipment or parts?
5. Are there any falling objects, covers or parts that could hurt you?
6. Is there a possibility to get hurt by toppling or overturning of unstable products?
7. Is there any possibility of getting any body part caught in a pinch point?
8. If there is a possibility to get oneself hurt by a pinch point then there is no guard or barrier provided?
9. There are no mechanical interlock\* / blocking devices provided

# CHEMICAL HAZARDS

## OSHA Listed Agents

### The chemical used in the laboratory are listed in Annexure II (If “NO” then proceed to section 2: Chemical Hazards; General Training Issues, next page)

* 1. The area where the chemical is handled, stored, processed or released is non-regulated
  2. The chemicals are not stored in sealed containers
  3. The researcher does not use gloves while handling the chemical
  4. The researchers are not provided with and not required to wear clean, full body protective clothing’s (smocks coverall, or long sleeved shirts and pants), shoes and gloves prior to entering the regulated area where the chemical (chemicals 1-9 of the annexure II ) are used.
  5. The researcher does not wash his hands, forearms, face and neck upon completion of the assigned task
  6. There are no laboratory hoods available in locations where the chemicals are used
  7. There is no vent for local exhaust in the area where the chemical is used
  8. The researchers are not required to remove and leave the protective clothing and equipment at the point of exit from the regulated area where the chemical is used
  9. The containers used for storing the chemicals are not labeled with

1. full chemical name
2. chemical abstract service number (CAS)
3. Registry number
   1. There are no Material Safety Data Sheet (MSDS) available in the facility
   2. There are drinking fountains near the area where the chemicals are used
   3. Food or drinks are allowed in area where the chemicals are handled

## General Training Issues

### Chemicals do not meet the air-contaminant limit as listed in 29 CFR 1910.1000

* 1. MSDS for each chemical used in laboratory are not available

### Storage of Chemicals

* 1. Chemicals are not stored in proper storage cabinet
  2. Chemical containers are not sealed / capped or labeled.
  3. Chemical are not used /stored in minimum quantities
  4. Oxidizers are not separated from organics
  5. Flammable storage cabinets are not used to store flammable chemicals

### Cylinders

* 1. Gas cylinders are not labeled
  2. Compressed gas cylinders are not secured in upright position
  3. Compressed gas cylinders are not capped

### Fume Hood

* 1. Fume hood are not used in areas where chemicals are used
  2. Fume hood is not annually inspected
  3. Apparatus / chemicals block the air- flow of the fume hood
  4. Chemicals are stored in the fume hood
  5. The fume hood has poor lightning

### Personnel Protective Equipment (PPE)

* 1. PPE for face and eye protection are not provided
  2. Eye and face protectors are not comfortable. They do not fit snugly (fitting closely and comfortably) and interfere with wearer’s movements
  3. Lab coats are not required / provided
  4. Gloves are not required while handling chemicals

# PHYSICAL HAZARDS

## Electrical Hazards

1. Is there any equipment that needs voltage greater than or equal to 120 Volts
2. Electrical interlocks are not available where necessary
3. Is there live electrical wires overhead, on the wall or on the floor?
4. Greater than 50 volts equipment are guarded or secured in enclosures
5. Overhead electrical lines are less than 10 feet from the equipment or are within the reach of people
6. Other than ground wires, there are wires running overhead, on the wall or on the floor possessing a tripping / falling hazard
7. Wires have damaged or missing insulation
8. Equipment has broken connections
9. Equipment is not grounded
10. GFCI system is not available by any sink or potentially wet areas
11. There have been instances of circuit breakers, fuses, or cutout openings deactivating the equipment
12. There are points such as motor brushes or open circuit breakers where arcing / sparking can occur near a fuel
13. Acid-based batteries are not firmly secured or kept in proper ventilated compartments to avoid the accumulation of hydrogen during charging
14. Battery operated equipment is not marked with polarity, voltage and type of battery to be used
15. Motor driven mechanical equipment does not have an emergency stop switch

## Fire Safety Hazards

### Laboratory Practices

* 1. The manufacturer's instructions for lighting a gas pilot light are not followed or an alternative method is used
  2. Matches are lighted after turning on the gas, if pilot lighting is required
  3. Flammable materials and liquids are stored within 10 feet of the ignition sources such as burners, hot-plates, electrical units, etc.
  4. Flammable liquids are stored in unlabeled, loosely closed containers.

### Detectors

* 1. There are no smoke detectors in the laboratory
  2. There is no carbon monoxide detector in the laboratory and fossil fuels are in use
  3. Smoke detectors and carbon monoxide detectors are not tested according to manufacturer's instructions on a regular basis (at least once a month)
  4. Batteries in the detectors are not replaced according to manufacturer's instructions nor annually
  5. Fire alarm/ fire detection equipment are not provided
  6. Sprinkler systems are not provided
  7. Fire detection equipment or sprinkler system are not periodically inspected

### Emergency Evacuation

* 1. Researchers are not trained in evacuation routes for the facility
  2. Exit routes are partially obstructed or are used for storage (i.e. exit routes are blocked)
  3. Emergency evacuation routes are not posted
  4. Emergency evacuation and building reentry procedures are neither written nor available
  5. Equipment shutdown procedures or applicable emergency operation are not readily available to all laboratory occupants
  6. A fire drill has never been conducted

### General Safety

* 1. No warning signs are listed on the door of the laboratory (e.g. NFPA diamond, biohazards, etc.)
  2. Laboratory fume hoods are not inspected on an annual basis
  3. Laboratory fume hoods do not have current inspection/certification labels
  4. Quantity of flammable/combustible liquids exceeds storage limits as specified by the OSHA and D.O.T.
  5. Refrigerators for flammable are not explosion proof type (i.e. residential type refrigerators are used to store flammable liquids)
  6. Gas cylinders not in use are not stored in an appropriate location anchored by chains, clamps, or stands
  7. Cylinders not in current use have the regulators on or the caps are unsecured
  8. Electrical receptacles, switches and controls are located in areas which are near water sources
  9. Circuit breaker panels and electrical transformers are not free of storage within 30 inches of the panel face in laboratories and mechanical spaces
  10. Facility is not equipped with fire – extinguisher
  11. Fire – extinguisher is not easily accessible
  12. Lab – personnel are not trained in using a fire- extinguisher

## Noise Hazards

1. A raised voice is needed to communicate with someone about one meter away
2. Researchers working in the area notice a reduction in hearing over the course of the day (This reduction might not be noticed until after work.)
3. Researchers experience any of the following:
   1. ringing in the ears (tinnitus),
   2. the same sound having a different tone in each ear
   3. blurred hearing (i.e. hear sounds but can’t figure out the words)
4. Are any long-term researchers hard of hearing?
5. There is no equipment to measure noise level in the laboratory
6. Does any equipment have manufacturer’s noise information (including labels) that indicates noise levels equal or greater than any of the following:
   1. 80 dB(A) LAeq\*, T \*\*
   2. 130 dB peak noise level,
   3. 85 dB (A) sound power level?
7. Personal hearing protectors are not provided
8. No signs indicating that personal hearing protectors should be worn are posted at the entrance or in the work area
9. The personal hearing protectors are ineffective
10. Ear protection devices do not fit the researcher or are not comfortable

Notes:

\* LAeq = equivalent continuous A-weighted sound pressure level to which the person is exposed, in decibels (A)

\*\* T = duration of segment, in hours

## Radiation Hazards

1. The following are used in the laboratory:
   1. Low frequency / radio frequency radiation, micro waves, infrared, visible and ultraviolet light, X rays and gamma rays, alpha rays, beta rays, electron or ion beams, neutrons, lasers.
   2. (If “NO” then proceed to Section:3 Physical Hazards, General Safety Hazards on next page)
2. Researchers have not contacted Environmental Health and Safety Department or radiation safety committee to get further training for radiation hazard management

## General Safety Hazards

1. Personnel Protective Equipments are not provided
2. Housekeeping condition in labs is not good / efficient
3. First Aid kits are not available
4. First aid kits are not fully stocked / maintained
5. Eye wash / safety shower are not provided
6. Eye wash / safety shower are not clean / maintained
7. Eye wash / safety shower are not easily accessible or are blocked
8. Tag out / lock out are not used as temporary warning until an appropriate action is taken

# PSYCHOLOGICAL AND ORGANIZATIONAL HAZARDS

1. People in leadership positions fail to trust the judgment of people in the workgroup
2. Those in leadership positions fail to take time to understand lab issues
3. The professor, instructor or supervisor is not approachable
4. The professor, instructor or research team supervisors provide little or no support of this research group
5. Leaders fail to communicate a clear site vision, clear goals and clear tasks
6. Technicians lack a clear understanding of their role in this organization and the responsibilities of the research
7. There is poor communication between groups/staff
8. The professors, instructors or lab supervisors are not available when assistance is needed
9. Staff and colleagues seldom discuss or share work approaches to solve problem together
10. There is lack of team spirit and no engaging work atmosphere
11. Individuals have little opportunity to contribute to the decision making which impacts the research
12. The decision making processes and structures are unfair and ineffective
13. There is no drop-box or anonymous method to express dissenting views and opinions.
14. There is no encouragement to give safety feedback
15. Staff members are undervalued or unappreciated
16. Individual duties in the research exceed authority or education level in some instances, potentially causing safety issues
17. It is not possible to manage research work demands without taking some safety shortcuts
18. Individuals occasionally experience negative feelings at work related to safety concerns

# BIOLOGICAL HAZARDS

### General Safety

* 1. Are any of the following biological agents used in the laboratory: bacteria, viruses, parasites, fungi?
  2. The research does involve use of animals or any animal product
  3. Bio-safety cabinet is not used
  4. Hand washing sink is not available in facility

### Infectious Waste

* 1. Infectious waste is not disposed in separate containers
  2. Infectious waste containers are not labeled
  3. Infectious waste containers are not covered nor have a lid
  4. Researchers are not aware about the proper disposal of the infectious waste

**Annexure I**

***HIGH Risk Repetition rates by different body parts***

|  |  |
| --- | --- |
| **Body Part** | **Repetitions per minute** |
| Shoulder | More than 2ft |
| Upper arm /Elbow | More than 10 |
| Forearm / Wrist | More than 10 |
| Finger | More than 200 |

**Annexure II**

|  |  |  |
| --- | --- | --- |
|  | Carcinogens | Chemical Abstracts Service (CAS No.) |
| 1 | 4-Nitrobiphenyl | CAS No. 92933 |
| 2 | Alpha-Naphthylamine | CAS No. 134327 |
| 3 | methyl chloromethyl ether | CAS No. 107302 |
| 4 | 3,¢-Dichlorobenzidine (and its salts) | CAS No. 91941 |
| 5 | bis-Chloromethyl ether | CAS No. 542881 |
| 6 | beta-Naphthylamine | CAS No. 91598 |
| 7 | Benzidine | CAS No. 92875 |
| 8 | 4-Aminodiphenyl | CAS No. 92671 |
| 9 | Ethyleneimine | CAS No. 151564 |
| 10 | beta-Propiolactone | CAS No. 57578 |
| 11 | 2-Acetylaminofluorene | CAS No. 53963 |
| 12 | 4-Dimethylaminoazo-benezene | CAS No. 60117 |
| 13 | N-Nitrosodimethylamine | CAS No. 62759 |