

## The Risk Guide in the Physics Department

### Introduction

Occupational safety and health are of utmost importance in any work environment, especially in departments that include special considerations like the Physics Department. This guide aims to provide comprehensive guidelines and directions for employees and students in the Physics Department to help reduce risks and maintain their safety and health while working or learning.

This guide includes information about hazardous materials used in physics activities, in addition to devices and equipment that can pose a risk to health and safety. Methods for handling these materials and devices safely will be clarified, along with prevention procedures and measures that must be taken to mitigate risks.

All employees and students must read and thoroughly understand this guide, and adhere to the instructions and procedures contained within it to ensure their personal safety and health while working or learning in the Physics Department.

We hope that this guide will be a useful and reliable resource for all employees and students, and we encourage sharing any observations or suggestions aimed at improving work safety in the department.

**The Risk Guide in the Physics Department is a document that typically contains a list of potential hazards that individuals may encounter while working in a physics environment, whether they are students, teachers, or researchers. This guide aims to make individuals aware of potential hazards and how to deal with them safely.**

- List of Hazardous Materials: Hazardous chemicals or devices that could pose a risk to health or safety should be identified and clarified.
- Safety Procedures: Outline the procedures that must be followed to avoid hazards, such as wearing protective equipment, storing hazardous materials properly, and providing adequate ventilation.
- Staff Training: Intensive training must be provided to employees and students on how to handle hazardous materials safely, as well as how to use protective devices and equipment.
- Emergency Procedures: Clear guidelines must be provided on how to act in emergencies such as hazardous material spills or fire incidents.
- Risk Assessment: Periodic risk assessments of the work environment must be conducted, and the risk guide updated based on any new changes.
- Compliance with Legislation and Regulations: It must be ensured that the risk guide complies with all local and national laws and regulations related to occupational safety and health.
- Elements for addressing a hazard after its occurrence.

**List of some hazardous materials that may be present and pose a risk to health or safety:**

1. **Strong Acids and Bases:** Such as sulfuric acid, hydrochloric acid, and strong alkalis like sodium hydroxide. These materials pose a risk upon direct exposure to the skin and eyes and can cause serious burns.
2. **Toxic Chemicals:** Such as mercury and volatile organic compounds. Direct exposure to these materials may lead to body poisoning and serious long-term health effects.
3. **Flammable Materials:** Such as organic solvents like ethanol and acetone. These materials may ignite easily if exposed to heat or a spark, which could lead to fires and explosions.
4. **Chemicals Harmful to the Environment:** Such as some materials used in photography which may be toxic and pollute the environment if not disposed of properly.

Providing appropriate preventive measures such as using personal protective equipment, good ventilation, and proper disposal of chemical waste can reduce the risks of exposure to these hazardous materials in physics laboratories.

There are several steps that can be taken to ensure safe handling of each hazardous material in the risk guide. Here are some general guidelines:

1. **Provide Appropriate Training:** All individuals who may handle hazardous materials must receive the necessary training on how to handle these materials safely, as well as the correct methods for storage and disposal. All workers and students must understand how to use protective equipment correctly and handle hazardous materials.
2. **Wear Protective Equipment:** Individuals handling hazardous materials must wear appropriate protective equipment, such as safety goggles, protective gloves, lab coats, and appropriate footwear, to reduce the risk of direct exposure to hazardous materials.
3. **Provide Good Ventilation:** Areas where hazardous materials are used must be equipped with an effective ventilation system to reduce exposure to harmful fumes or toxic gases. The area should be cleaned regularly and ventilated to limit the accumulation of harmful gases.
4. **Safe Storage:** Hazardous materials must be stored in appropriate and secure places according to occupational safety and health information. Warning labels and signs should be placed on all containers to identify the type of material and its hazards, kept away from untrained individuals, and containers should be tightly sealed to avoid leakage.
5. **Act with Caution:** Hazardous materials must be handled cautiously, with extreme care taken during transportation, unloading, or use, avoiding any behavior that might increase the risk of exposure.

**Safe Disposal:** Hazardous materials must be disposed of in the appropriate manner according to local laws and regulations, preferably by contracting with specialized entities for safe disposal of hazardous materials.

6. **Reporting Incidents and Hazards:**

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- All employees and students must report any accidents or potential hazards immediately upon occurrence. This helps in taking necessary actions to prevent further injuries or damages.

#### 7. **Periodic Inspection and Maintenance:**

- Periodic checks must be conducted on all equipment, devices, and materials to ensure their safety and suitability for use. Periodic maintenance and necessary repairs should be performed when needed.

#### 8. **Providing Emergency Plans:** Appropriate emergency plans must be established in case of accidents or hazardous material spills, and workers must be trained on these plans and how to act in emergencies.

These procedures aim to ensure the safety of all individuals working or learning in the Physics Department and to mitigate potential risks associated with work in this field.

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In the Physics Department, there are many devices that may pose a risk to health or safety if not handled carefully. Here are some examples of devices that could be hazardous:

1. High-voltage electrical generators: Such as high-voltage alternating current sources or Van de Graaff generators.
2. High-voltage direct current devices: Such as high-voltage DC sources used in physics research or experiments.
3. Electron generation and diffraction devices: Such as electron beams, electron generators, and accelerator beams.
4. Laser devices: Especially high-power lasers that can cause serious physical injuries if not handled carefully.
5. Radiation generating devices: Such as X-ray sources or devices used in nuclear experiments.
6. Large and heavy equipment: Such as large magnets used in physics experiments or large cooling devices.
7. Pressure and vacuum devices: Such as vacuum pumps and pressure vessels that can cause accidents if not controlled properly.
8. Cooling and heating devices: Such as chemical cooling devices or electric heating devices that can ignite if not used correctly.

**To handle each type of these devices safely, it is preferable to follow the following guidelines:**

#### 1. **High-voltage electrical generators:**

- Ensure the use of appropriate electrical insulation to reduce the risk of electric shock.
- Train workers on correct safety procedures to avoid exposure to high electric current.

#### 2. **High-voltage direct current devices:**

- Provide emergency switches and electrical insulation tools for dealing with emergency situations.
- Use protective equipment such as insulating gloves when handling high-voltage wires.

3. **Electron generation and diffraction devices:**

- Wear protective clothing and safety goggles to protect the eyes from radiation.
- Designate specific areas for operation and storage to limit exposure to radiation.

4. **Laser devices:**

- Provide appropriate safety goggles for each type of laser.
- Place warning signs and designate hazardous areas to avoid sudden exposure to beams.

5. **Radiation generating devices:**

- Use personal protective equipment such as protective shields to reduce radiation exposure.
- Designate specific operating areas and provide additional protective measures for workers.

6. **Large and heavy equipment:**

- Provide necessary safety measures to prevent injuries from slipping or falling.
- Designate safe pathways for movement around large equipment and provide appropriate preventive measures.

7. **Pressure and vacuum devices:**

- Train workers on how to use vacuum pumps safely according to specified procedures.
- Inspect equipment regularly to ensure its safety and efficiency.

8. **Cooling and heating devices:**

- Ensure devices are maintained regularly according to the maintenance schedule specified by the manufacturer.
- Provide good ventilation to reduce the accumulation of harmful gases and excess heat.

These guidelines are based on general safety principles and the details of safe handling for each device may vary according to individual circumstances and the specific requirements of each work site. It is always important to adhere to the specific instructions for each device and follow the specified safety procedures to reduce the risk of accidents and injuries.

**Some types of furnaces that may be hazardous:**

1. **High-temperature furnaces:** Include heating furnaces that reach very high temperature levels, which can cause serious burns if not handled carefully.
2. **Welding connection furnaces:** Welding operations require the use of furnaces to heat metals, which can emit toxic gases or contain hazardous chemicals.
3. **Thermal test furnaces:** Used in thermal testing of materials, and must be handled with caution to avoid exposure to high temperatures or hazardous materials.
4. **Chemical processing furnaces:** Some chemical drying processes may involve furnaces containing hazardous chemicals or releasing toxic gases during operation.
5. **Chemical manufacturing furnaces:** Used in the preparation of chemicals and analyses, and may contain hazardous materials or release chemical fumes that may be toxic.
6. **Nuclear material manufacturing furnaces:** Used in the production of nuclear materials, and require special care to avoid exposure to fine particles and toxic gases that may be produced during operation.

Some guidelines on how to safely handle different types of furnaces in the Physics Department:

1. **High-temperature furnaces:**

- Ensure wearing appropriate protective clothing and equipment such as gloves and safety goggles.
- Avoid touching hot surfaces directly, and use appropriate protective tools when moving samples inside the furnace.
- Ensure good ventilation in the area to reduce the accumulation of heat and toxic gases.

2. **Welding connection furnaces:**

- Wear personal protective equipment such as welding gloves, face shields, and protective clothing.
- Operate furnaces in well-ventilated areas to limit exposure to toxic gases released during welding.
- Ensure following the specific safety procedures for each type of welding operation.

3. **Thermal test furnaces:**

- Read and understand the safety instructions for each device before using it.
- Wear protective clothing and gloves when handling hot samples.
- Avoid touching hot parts directly and use appropriate protective tools.

4. **Chemical processing furnaces:**

- Operate furnaces in a well-ventilated environment to limit exposure to harmful chemical fumes.
- Use personal protective equipment such as gloves and safety goggles when handling chemicals.

5. **Chemical manufacturing furnaces:**

- Ensure following the correct procedures for storing and handling chemicals safely.
- Wear personal protective equipment such as gloves and protective coats when handling chemicals inside the furnace.

These are some general guidelines, and it is always essential to follow the specific procedures for each type of furnace and the equipment used in it, according to the instructions specified by the manufacturer and the applicable health and safety regulations.

Some guidelines for safely handling radioactive materials:

1. **Training and Awareness:**

- All individuals who handle radioactive materials must receive the necessary training on how to handle them safely according to sound safety guidelines.

2. **Personal Protection:**

- Workers must use appropriate personal protective equipment such as protective shields, goggles, and protective clothing to reduce radiation exposure.

3. **Ventilation:**

- A good ventilation system must be provided to reduce the accumulation of radioactive gases and particles in the environment.

4. **Storage:**

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- Radioactive materials must be stored in designated, secure places away from areas frequented by workers.
- 5. **Exposure Control:**
  - Necessary procedures must be followed to limit radiation exposure, such as using protective shields and approaching the radioactive source for the shortest possible time.
- 6. **Safe Disposal:**
  - Radioactive materials must be disposed of safely according to local and international legislation and regulations.
- 7. **Monitoring and Measurement:**
  - Radiation levels must be monitored regularly using appropriate measuring devices, and readings documented and risks assessed regularly.
- 8. **Cooperation and Communication:**
  - The teams concerned with occupational safety and health must cooperate and communicate continuously to ensure the effective implementation of safety procedures.

#### Staff Training:

Providing intensive training for employees and students is vital to ensuring their safety and health while working in the Physics Department. This appropriate training includes instructions on how to handle hazardous materials safely, as well as how to effectively use protective devices and equipment.

1. **Identifying Hazards and Warnings:**
  - The risks related to hazardous materials used in the department must be clarified, in addition to identifying the necessary preventive procedures to avoid these risks.
2. **How to Handle Hazardous Materials:**
  - Detailed training must be provided on how to handle hazardous materials safely, including proper storage, correct disposal methods, and safe cleaning procedures.
3. **Using Protective Devices and Equipment:**
  - It must be clarified how to use and maintain protective devices and equipment correctly, ensuring that all workers know how to wear and use them properly.
4. **Practical Training:**
  - Opportunities for practical training on various preventive procedures and the use of protective equipment should be provided, along with necessary supervision and guidance.
5. **Evaluation and Monitoring:**
  - Periodic evaluation of the occupational safety and health skills of employees and students should be conducted, and necessary measures taken to improve performance and compliance with standards.

Providing this intensive training ensures that everyone is prepared to handle hazardous materials and devices safely and effectively, and contributes to creating a safe and healthy work environment for all.

#### Emergency Procedures:

##### 1. Emergency Plans:

- Specific and clear emergency plans must be provided to address various potential emergency scenarios, including hazardous material spills, fire incidents, and others.

##### 2. Emergency Training:

- All employees and students must be trained on how to act in emergencies, including evacuation procedures, use of firefighting equipment, and first aid.

##### 3. Evacuation and Assembly:

- Evacuation areas and predetermined assembly points must be identified, and how to reach and assemble there in emergencies clarified.

##### 4. Use of Firefighting Equipment:

- Intensive training must be provided on how to use different firefighting equipment, such as heat sensors, portable extinguishers, and fire hoses.

##### 5. Reporting and Guidance:

- Clear guidelines must be provided on how to report emergencies and direct people to the correct procedures for dealing with them.

##### 6. Hazardous Material Spills:

- Procedures for dealing with hazardous material spills should be clarified, including immediate reporting, ventilation, and use of personal protective equipment.

##### 7. Fire Incidents:

- Everyone must be trained on the use of fire extinguishers and safe conduct in fire situations, including escaping from buildings and providing first aid.

##### 8. Evaluation and Continuous Improvement:

- Periodic evaluation of emergency plans and performance during emergencies should be conducted, with necessary measures taken to enhance preparedness and response.

#### Risk Assessment:

Risk assessment is an essential part of occupational safety and health management in the Physics Department, as it contributes to identifying and evaluating potential risks and taking the necessary preventive measures to deal with them.

##### 1. Identifying Hazards:

- All potential hazards in the work environment must be identified, including hazardous materials, large equipment, hazardous processes, and other job classifications.

##### 2. Risk Assessment:

- This involves assessing the probability and potential impact of each risk, in addition to determining the level of exposure and the possibility of controlling it.

##### 3. Taking Preventive Measures:

- Based on the results of the risk assessment, the necessary preventive measures must be taken to reduce risks to the lowest possible level, such as providing protective equipment, improving work procedures, and providing appropriate training.



**4. Continuous Evaluation:**

- Periodic risk assessments must be conducted to ensure that all potential risks have been properly reviewed and assessed, and updates made to the assessments as needed.

**5. Updating the Risk Guide:**

- The risk guide must be updated based on the results of the periodic assessment and any new changes in the work environment, to ensure that the safety guide is up-to-date and reliable.

**6. Awareness and Training:**

- Appropriate awareness and training must be provided to all employees and students about potential risks and how to deal with them safely.

Regularly assessing risks and updating the safety guide contributes to creating a safe and healthy work environment for everyone, and maintains their safety and health while performing activities in the Physics Department.

**Compliance with Legislation and Regulations:**

Compliance with university legislation and regulations is an urgent necessity to ensure the safety and health of workers in the Physics Department.

The risk guide should also be updated regularly to ensure continued compliance with the latest legislation and regulations, incorporating any new legal changes into the guide.

**Awareness of Legislation:**

- Appropriate awareness must be provided to all employees and students about local and national legislation and regulations related to occupational safety and health, clarifying how to comply with them.

**Compliance Training:**

- Appropriate training must be provided to employees and students on how to comply with legislation and regulations, and the necessity of adhering to the procedures specified in the risk guide.

**Monitoring and Evaluation:**

- Compliance with legislation and regulations should be monitored and evaluated periodically, and necessary actions taken to improve compliance if any deviations exist.

Compliance with legislation and regulations contributes to creating a safe and sound work environment and protects employees and students from potential risks related to work in the Physics Department.

**Elements of hazard treatment include a series of actions taken to deal with a hazard after its occurrence, aiming to reduce potential negative impacts and restore the situation to normal. Among these elements:**

1. **Immediate Hazard Assessment:** The hazard must be assessed immediately upon occurrence to determine its severity and potential impacts on health and safety.



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2. **Taking Emergency Actions:** Immediate actions must be taken to deal with the situation, such as stopping work in the affected area, alerting supervisors and other workers, and implementing evacuation procedures if necessary.
3. **Providing Medical Care:** In case of injuries, necessary medical care must be provided immediately, whether through on-site first aid or transferring the injured to medical facilities.
4. **Reporting and Documentation:** The incident must be documented and reported in sufficient detail, including the details of the incident, actions taken, and resulting damages.
5. **Investigation and Analysis:** A comprehensive investigation of the incident must be conducted to understand its causes and identify the factors that led to its occurrence, in order to take preventive measures to avoid similar accidents in the future.
6. **Implementing Preventive Measures:** Necessary preventive measures must be taken to prevent the occurrence of similar accidents in the future, such as improving safety procedures, training on hazard handling, and using protective equipment.
7. **Controlling Residual Risks:** Actions must be taken to control residual risks after analyzing the incident, including modifying processes or procedures or using new technology to effectively reduce risks.
8. **Follow-up:** The implementation of corrective actions must be followed up and their effectiveness evaluated to ensure that the hazard has been adequately addressed and the situation has returned to normal.