

 AN TOÀN NAM VIỆT



LABOR SAFETY TRAINING MATERIALS FOR THE MECHANICAL INDUSTRY



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This training document equips workers with safety knowledge and preventive measures against hazards when operating various mechanical machines in close proximity to moving parts.

PART 1: GENERAL INTRODUCTION TO MACHINERY AND MECHANICAL TOOLS

A. TYPES OF MACHINE TOOLS USED IN ACTUAL PRODUCTION

1. Lathe in Mechanical Safety Documentation

- Workpieces must be clamped securely using fixtures such as chucks, tailstocks, etc.
- When turning fast-spinning parts, the center of the tailstock must be rotating.
- For long workpieces, a steady rest is required to prevent them from flying off due to centrifugal force.
- If the workpiece extends too long and protrudes from the gearbox, a support stand must be used to prevent bending.
- Filing sharp edges during turning is not allowed as it may cause accidents.
- To prevent long chips from forming, the turning tool should have an appropriate chip breaker angle.

2. Milling Machine in Mechanical Safety Documentation

- Even though milling has lower cutting speeds than turning, safety must still be a priority.
- Screws on the milling table, dividing head, and other parts must be well-covered.
- Specialized clamps should be used when mounting or removing the milling cutter.
- Hands must not be placed near the active cutter.
- The flywheel brake mechanism of the milling machine must operate efficiently and safely.

3. Drilling Machine in Mechanical Safety Documentation

- The drill bit must be securely clamped and aligned with the spindle.
- Workpieces should be clamped directly or via fixtures on the drilling table.
- Never use hands to hold the workpiece or wear gloves while drilling.
- When chips wrap around the drill bit, do not remove them with your hands.

4. Grinding Machine in Mechanical Safety Documentation

- Grinding machines have high speeds (20-30 m/s), and high-speed grinding can reach 50 m/s.
- Grinding wheels are made of hard materials bonded from fine powders, but they are brittle and cannot withstand impact and vibration.
- Grinding wheels must be stored in dry places, away from acids and corrosive substances.
- Grinding wheels with magnesium bonding should not be used if stored for more than a year.
- Grinding wheel selection must match the technical requirements of the machining process.
- Steel hammers must not be used for adjusting the grinding wheel.

- Grinding wheels must be clamped evenly between equal-sized flanges with a layer of elastic material in between.
 - Dynamic balancing and mechanical strength tests must be performed on grinding wheels before use.
5. **Planer in Mechanical Safety Documentation**
- Planers must have controlled stroke lengths for the cutting tool.
 - Moving parts like gears and racks must be shielded.
 - Workpieces must not be adjusted while the machine is running.
 - Do not pass in front of the machine during operation.

B. STRUCTURE AND OPERATING PRINCIPLES OF EACH TYPE OF EQUIPMENT

1. **Lathe in Mechanical Safety Documentation**
- **Structure of the Lathe:** Describes the high-speed lathe, divided into four main parts: base, gearbox, tool carriage, and tailstock.
 - **Operating Principle of the Lathe:** Involves the rotation of the workpiece and the linear motion of the cutting tool.
2. **Milling Machine in Mechanical Safety Documentation**
- **Structure of the Milling Machine:** Includes parts like the base, column, knee, table, spindle, and overarm.
 - **Operating Principle of the Milling Machine:** Involves the rotation of the milling cutter and the movement of the workpiece.
3. **Drilling Machine in Mechanical Safety Documentation**
- **Technical Characteristics of Rock Drilling Machines:** Details specifications and operation of hydraulic-driven rock drills.
4. **Grinding Machine in Mechanical Safety Documentation**
- **Types of Grinding Machines:** Covers cylindrical and surface grinders, including various grinding techniques.
5. **Planers and Shapers in Mechanical Safety Documentation**
- **Planer Types:** Discusses horizontal, vertical, and special planers for different machining tasks.
 - **Shaper Operating Principles:** Describes the linear reciprocating motion for cutting surfaces.

C. SAFETY STANDARDS AND REGULATIONS FOR EQUIPMENT OPERATORS

1. **General Regulations**
- Applies to handheld motor-operated electric tools with specified voltage limits.
 - Excludes tools used in hazardous environments, for food processing, medical purposes, or in transportation.
2. **Technical Requirements**
- Tools must meet safety standards as specified in TCVN 7996-1:2009 (IEC 60745-1:2006) and specific parts of TCVN 7996.

PART 2: BASIC TECHNICAL CHARACTERISTICS OF EACH EQUIPMENT

A. BASIC TECHNICAL CHARACTERISTICS OF CONSTRUCTION MACHINERY -

Concrete Mixers: Structure, working principles, and productivity. - **Concrete Vibrators:** Types, characteristics, and applications. - **Crushers and Screeners:** Describes combined crushing and screening stations used on construction sites.

B. BASIC TECHNICAL CHARACTERISTICS OF MECHANICAL MACHINERY -

Lathes: Operating principles and technological capabilities. - **Drilling Machines:** Types, working principles, and technological applications. - **Milling Machines:** Types, operating principles, and technological applications. - **Planers and Shapers:** Working principles and technological capabilities. - **Reamers:** Used for fine-tuning pre-drilled holes.

PART 3: OPERATING PROCEDURES

A. EQUIPMENT CHECKS AND PREPARATIONS BEFORE OPERATION

1. Operational Procedures

- Develop procedures for situations where guards need to be removed or safety devices are not in operation.
- Procedures must include steps for checking and testing machinery without guards for maintenance purposes.
- Ensure proper lockout/tagout (LOTO) procedures are in place to prevent accidental start-up during maintenance.

2. Safety Awareness and Training

- Workers must be trained on recognizing hazards associated with operating machinery.
- Emphasize the importance of wearing personal protective equipment (PPE) and following safety protocols.
- Conduct regular safety briefings and visual demonstrations to maintain high awareness.

3. Maintenance and Repair Procedures

- Conduct regular inspections to ensure machinery is in good working condition.
- Follow a maintenance schedule to prevent unexpected breakdowns and ensure safety devices are functioning.
- Document all maintenance activities and repairs performed on machinery.

B. SPECIFIC SAFETY MEASURES FOR DIFFERENT MACHINERY

1. Lathe

- Ensure workpieces are securely clamped before starting the machine.
- Use appropriate cutting tools and ensure they are properly installed.
- Do not leave the machine running unattended.

2. Milling Machine

- Verify that the cutting tools are securely mounted.
 - Ensure the workpiece is properly clamped and aligned.
 - Use guards and shields to protect against flying chips and debris.
3. **Drilling Machine**
 - Secure the drill bit and ensure it is properly aligned with the spindle.
 - Clamp workpieces securely to prevent movement during drilling.
 - Avoid wearing loose clothing or gloves that can get caught in the machine.
 4. **Grinding Machine**
 - Inspect grinding wheels for cracks or damage before use.
 - Ensure wheels are properly balanced and securely mounted.
 - Use protective shields and wear appropriate PPE to guard against flying particles.
 5. **Planers and Shapers**
 - Check that all moving parts are properly lubricated and in good condition.
 - Ensure the workpiece is securely clamped before operation.
 - Use guards to protect against moving parts and flying debris.

C. HAZARDOUS AND HARMFUL FACTORS WHEN WORKING WITH MACHINERY

1. **Types of Accidents**
 - Slips, trips, and falls.
 - Crushing or impact injuries from collapsing or falling objects.
 - Burns from hot materials or surfaces.
 - Electrical shocks.
 - Puncture wounds from sharp objects.
 - Entanglement of clothing or hair in moving parts.
 - Injuries from flying chips or debris.
2. **Causes of Accidents**
 - Inadequate or missing safety guards.
 - Faulty safety devices.
 - Malfunctioning control systems.
 - Violation of safety standards and regulations.
 - Poor housekeeping and cluttered work areas.
 - Insufficient lighting and ventilation.
 - Poorly maintained machinery and equipment.

D. PRINCIPLES FOR ENSURING SAFETY IN MECHANICAL OPERATIONS

1. **General Principles**
 - Adhere to all safety and hygiene regulations during the design, manufacture, installation, use, and maintenance of machinery.
 - Identify hazardous areas and potential risks associated with machinery.
 - Implement appropriate safety measures.
 - Organize the workspace to ensure safety and efficiency.
2. **Safety Principles for Machine Operation**

- Only authorized personnel should operate machinery.
 - Check safety devices and ensure they are in place before starting the machine.
 - Do not leave machinery running unattended.
 - Follow lockout/tagout procedures during maintenance.
3. **Guidelines for Safe and Efficient Machinery Operation**
- Choose machines that are safe and easy to operate.
 - Ensure all moving parts are properly guarded.
 - Use automatic stops or two-handed controls where necessary.
 - Implement safe material handling procedures to increase productivity and reduce risks.
 - Regularly maintain and inspect machines to ensure safety and efficiency.
 - Use appropriate PPE for all operations.
 - Display clear warning signs in hazardous areas.
 - Ensure electrical systems are safe and comply with regulations.
 - Implement fire prevention measures.

E. DEVELOPING SAFE OPERATING PROCEDURES

1. **Establishing Safe Operating Procedures**
- Develop clear procedures for safe machine operation, including startup and shutdown processes.
 - Ensure all workers are trained on these procedures and understand the importance of following them.
 - Regularly review and update procedures to reflect any changes in equipment or regulations.
2. **Implementing Safety Measures**
- Use barriers, warning signs, and guards to prevent unauthorized access to hazardous areas.
 - Conduct regular safety audits to identify potential hazards and implement corrective actions.
 - Encourage a culture of safety by involving workers in safety planning and decision-making.

PART 4: TECHNICAL REQUIREMENTS AND STANDARDS

A. NATIONAL TECHNICAL REGULATIONS ON SAFETY FOR HANDHELD MOTOR-OPERATED ELECTRIC TOOLS (QCVN 09:2012/BLDTBXH)

1. **Scope of Application**
- Applies to handheld electric tools with a nominal voltage not exceeding 250V for single-phase AC/DC tools, and 440V for three-phase AC tools.
 - Includes tools that can be mounted on stands or bases for fixed use without altering the tool itself.

2. Exclusions

- Tools designed for special environments such as explosive atmospheres.
- Tools used for food processing or medical purposes.
- Heating tools covered by TCVN 5699-2-45 (IEC 60335-2-45).
- Tools designed for use on transportation vehicles, which must comply with additional safety requirements.

3. Technical Requirements

- Handheld electric tools must meet safety standards as specified in TCVN 7996-1:2009 (IEC 60745-1:2006) and relevant parts of TCVN 7996 Part 2.
- Updates to these standards must be adhered to as per the latest regulations.

4. General Provisions

- The scope includes manufacturers, importers, distributors, and users of handheld motor-operated electric tools.
- Regulatory authorities and related organizations must also comply with these standards.

5. Definitions

- Terms used in this regulation follow the definitions provided in the National Standard TCVN 7996-1:2009 (IEC 60745-1:2006) and related standards in the TCVN 7996 series.

PART 5: SAFETY REQUIREMENTS FOR SPECIFIC MACHINERY

A. SAFETY REQUIREMENTS FOR CONSTRUCTION MACHINERY

1. Concrete Mixers

- Structure and components: mixing drum, motor, gearbox, frame, and safety guards.
- Operating principle: The drum rotates, mixing the components to produce concrete.
- Safety precautions: Ensure the mixer is stable, do not reach into the drum while it is rotating, and use appropriate PPE.

2. Concrete Vibrators

- Types: Internal (immersed) vibrators, surface vibrators, and form vibrators.
- Operating principle: Vibrations compact the concrete, removing air bubbles and ensuring a solid structure.
- Safety precautions: Securely handle the vibrator, avoid prolonged exposure to vibrations, and use ear protection.

3. Crushers and Screeners

- Combined crushing and screening stations: Used on construction sites for producing aggregate materials.
- Operating principle: Crushers break down large rocks, and screeners sort the material by size.

- Safety precautions: Regularly check and maintain machinery, ensure guards are in place, and wear appropriate PPE.

B. SAFETY REQUIREMENTS FOR MECHANICAL MACHINERY

1. Lathes

- Structure: Headstock, bed, carriage, tailstock.
- Operating principle: The workpiece rotates while the cutting tool moves along it to shape the material.
- Safety precautions: Secure the workpiece, use appropriate cutting speeds, and wear safety goggles.

2. Drilling Machines

- Types: Bench drills, vertical drills, radial drills, multi-spindle drills, and deep-hole drills.
- Operating principle: The drill bit rotates and moves into the workpiece, creating holes.
- Safety precautions: Secure workpieces, do not wear loose clothing or gloves, and ensure proper alignment of the drill bit.

3. Milling Machines

- Structure: Base, column, knee, table, spindle, overarm.
- Operating principle: The milling cutter rotates, and the workpiece is fed into it to create the desired shape.
- Safety precautions: Secure workpieces, use proper cutting tools, and ensure all guards are in place.

4. Planers and Shapers

- Types: Horizontal planers, vertical planers, shapers.
- Operating principle: The cutting tool moves in a straight line, shaving material from the workpiece.
- Safety precautions: Secure workpieces, ensure proper lubrication of moving parts, and wear appropriate PPE.

5. Grinding Machines

- Types: Cylindrical grinders, surface grinders.
- Operating principle: The grinding wheel rotates, and the workpiece is brought into contact with it to remove material.
- Safety precautions: Inspect grinding wheels for damage, balance wheels before use, and use shields to protect against debris.

PART 6: RISK MANAGEMENT AND ACCIDENT PREVENTION

A. COMMON ACCIDENTS IN MECHANICAL OPERATIONS

1. Types of Accidents

- Slips, trips, and falls.
- Crushing injuries from falling objects.

- Burns from hot surfaces or materials.
 - Electrical shocks.
 - Cuts and puncture wounds from sharp objects.
 - Entanglement in moving parts.
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2. **Causes of Accidents**
- Inadequate or missing safety guards.
 - Faulty or missing safety devices.
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PART 7: EMERGENCY RESPONSE AND INCIDENT REPORTING

A. EMERGENCY RESPONSE PROCEDURES

- 1. Preparation**
- Develop and implement an emergency response plan.
 - Train all workers on emergency procedures, including evacuation routes and emergency contacts.
 - Conduct regular drills to ensure readiness.
- 2. Response**
- In case of an emergency, follow the established response plan.
 - Use emergency equipment such as fire extinguishers, first aid kits, and spill containment materials.
 - Report the emergency to the appropriate authorities and follow their instructions.

B. INCIDENT REPORTING AND INVESTIGATION

- 1. Reporting**
- All incidents, including near misses, must be reported immediately.
 - Use standardized forms to document the details of the incident.
- 2. Investigation**
- Conduct a thorough investigation to determine the root cause of the incident.
 - Implement corrective actions to prevent recurrence.
 - Share the findings with all relevant personnel to promote learning and improvement.
- 3. Follow-Up**
- Monitor the implementation of corrective actions to ensure they are effective.
 - Review incident reports and investigation findings regularly to identify trends and prevent future incidents.
 - Communicate lessons learned and safety improvements to all employees.

PART 8: TRAINING AND COMPETENCY DEVELOPMENT

A. TRAINING PROGRAMS

- 1. Initial Training**
 - Provide comprehensive safety training for all new employees, covering general safety principles and specific procedures for their roles.
 - Include practical demonstrations and hands-on training to ensure understanding.
- 2. Ongoing Training**
 - Conduct regular refresher training sessions to keep employees updated on safety procedures and new regulations.
 - Provide additional training for employees who are assigned new tasks or operate new equipment.
- 3. Specialized Training**
 - Offer specialized training for employees who work with particularly hazardous machinery or in high-risk environments.
 - Include advanced topics such as lockout/tagout procedures, confined space entry, and chemical handling.

B. COMPETENCY ASSESSMENT

- 1. Certification**
 - Require employees to pass competency assessments to demonstrate their understanding of safety procedures and their ability to perform tasks safely.
 - Provide certification for employees who successfully complete training programs and assessments.
- 2. Performance Monitoring**
 - Regularly evaluate employee performance to ensure continued compliance with safety procedures.
 - Provide feedback and additional training as needed to address any deficiencies.

C. RECORD KEEPING

- 1. Training Records**
 - Maintain detailed records of all training sessions, including attendance, topics covered, and assessments completed.
 - Ensure that records are up to date and easily accessible for review by regulatory authorities.
- 2. Incident Records**
 - Keep comprehensive records of all incidents, investigations, and corrective actions.
 - Use these records to identify trends and improve safety procedures.

PART 9: SAFETY COMMUNICATION AND AWARENESS

A. COMMUNICATION STRATEGIES

1. **Safety Meetings**
 - Hold regular safety meetings to discuss potential hazards, review incidents, and share best practices.
 - Encourage open communication and employee participation in safety discussions.
2. **Bulletins and Signage**
 - Use safety bulletins and signage to provide ongoing reminders of important safety procedures and hazard warnings.
 - Place signs in high-risk areas to reinforce the importance of following safety protocols.

B. PROMOTING A SAFETY CULTURE

1. **Leadership Commitment**
 - Ensure that management demonstrates a strong commitment to safety by leading by example and prioritizing safety in all decision-making.
 - Provide resources and support for safety initiatives.
2. **Employee Involvement**
 - Encourage employees to take an active role in promoting safety by participating in safety committees, reporting hazards, and suggesting improvements.
 - Recognize and reward employees who contribute to a safer workplace.
3. **Continuous Improvement**
 - Regularly review and update safety procedures to reflect new regulations, technologies, and best practices.
 - Foster a culture of continuous improvement where safety is viewed as an ongoing process.

PART 10: COMPLIANCE AND AUDIT

A. REGULATORY COMPLIANCE

1. **Understanding Regulations**
 - Stay informed about relevant safety regulations and standards that apply to your industry and operations.
 - Ensure that all safety procedures and equipment comply with these regulations.
2. **Internal Audits**
 - Conduct regular internal audits to assess compliance with safety procedures and identify areas for improvement.
 - Use audit findings to implement corrective actions and improve overall safety performance.

B. EXTERNAL AUDITS

1. Third-Party Audits

- Engage third-party auditors to conduct independent assessments of your safety programs and procedures.
- Use the results of these audits to benchmark your performance against industry standards and identify best practices.

2. Regulatory Inspections

- Prepare for inspections by regulatory authorities by ensuring that all safety procedures and records are up to date and in compliance.
- Cooperate fully with inspectors and promptly address any issues identified.

C. CONTINUOUS MONITORING AND REVIEW

1. Performance Metrics

- Develop and track key performance indicators (KPIs) related to safety, such as incident rates, near misses, and compliance levels.
- Use these metrics to monitor progress and identify areas for improvement.

2. Feedback and Improvement

- Regularly solicit feedback from employees on safety procedures and potential hazards.
- Use this feedback to make continuous improvements to your safety programs and procedures.

