Issue No.: 01 Rev. No.: 0

Date of issue: 23.08.2022

Doc. No: HSE/Standard/11 TITLE: Machine Safety



Machine Safety

Purpose

To ensure a safe operation and inspection of equipment and machinery including powered hand power tools used in manufacturing plants, work locations, R&D Centres, Ware house of HSCL, irrespective whether they are owned by company or used on behalf of company. The aim is to prevent injury / accident during operations of these equipment. However, this standard does not include hand tools, lifting equipment, pressure vessels etc.

Scope:

This Standard is mandatory and applies to all manufacturing plants (process areas, Lab, Electrical Panel Rooms, Control Rooms, Warehouses, Maintenance Workshops, off-site Field Execution areas etc.) of HSCL. A machine register must be available at all locations, covering all equipment and machinery.

Machine Hazard Assessment:

All equipment and machinery used by HSCL (on-site/ off-site) must be risk assessed for possible hazards, to ensure they are in good condition, fit and safe to use, thereby reducing chance of injury/ accidents to operators. All inter-locks, light barriers, light curtains, emergency switches and other safety controls shall also be risk assessed. The assessment shall include following hazards not limited to:

- Risk to employees operating equipment or machinery in terms of likelihood and Severity of injuries and the duration of exposure.
- Safe access to/from machines (access, egress) and escape during an emergency.
- · PPE, Loose clothing, hair and ornaments
- · Being struck by ejected parts of the machinery
- Being struck by material ejected from the machinery
- · Contact or entanglement with the machinery
- · Contact or entanglement with any material in motion
- Electrical hazards
- Chemical hazards (from cutting fluids, lubricants, etc.)

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- Burns, cuts and other injuries from materials or substances used/exhausted by the machinery
- Noise levels
- Material Storage and handling (manual material handling, ergonomics)
- Environment in which the machine is used (in a machine shop, or in a work site)
- Operating systems/ procedure/ instruction given by OEM
- Training.

General Rules for All Machines

- 1) Machine manual provided by OEM must be in the Machine Shop/department area with the machine. A standard operating procedure indicating safety features and their appropriate use must be made available to the user.
- 2) Only trained machine users are to use the specific machine they have been trained on.
- 3) Follow manufacturer instruction regarding monitoring of equipment that is in operation. Some machines (e.g. enclosed, computer-controlled machines) may be allowed to run without monitoring but other machines may require continuous monitoring during operation. Each machine will be different and users must be knowledgeable about these differences.
- 4) Ensure users know how and when to make adjustments to the machines. Some machines should not be adjusted while in motion for safety reasons while others may allow adjustments. Always follow manufacturer's instruction on how to safely make adjustments.
- 5) Applicable engineering controls, administrative controls, and/or personal protective equipment required for the machine must be present and in good condition prior to use.
- 6) The area of operation must be free and clear of obstructions and entanglement hazards. Space must be provided between each machine and other objects, including other machine operating areas, as needed, to allow safe operation of the machine.
- 7) Machinery and equipment must be inspected and maintained according to the manufacturer's recommendations. This information, along with safety-related

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guidelines, can be found in the operator's manual. If a manual is not available, the manufacturers should be contacted to obtain one.

8) Establish machine-specific Lockout Tagout (LOTO) procedures. Follow LOTO before attending a machine for repair or maintenance.

Roles and responsibilities

Supervisors/Line Managers -

- 1) Risk Assess all equipment, machinery, hand power tools, identify all risks and mitigate them before handing over to respective department.
- 2) Impart suitable training to users and record their training documents.
- 3) Ensure only qualified and authorized persons operate the machines and the power tools. No unauthorized person shall operate any equipment/ machine/ power tool.
- 4) Develop, document, implement and maintain appropriate work procedures, measures, inspections, and precautions and emergency procedures to control the hazards that may be present by using these guidelines and in accordance to applicable Statutory Standard. If necessary, HIRA can be made as a supporting guideline.
- 5) Establish OK TO START
- 6) Ensure that all designated machine users have adequate training on the operation of machines and power tools and documenting that such training has taken place (e.g. Attendance Sheet). The content of the training will depend on the type of activities, machines, tools and hazards present.
- 7) Ensure all written procedures are readily available to machine users.
- 8) Ensure that the machines and power tools are maintained and in good condition.
- 9) Establish machine-specific Lockout Tagout (LOTO) procedures.
- 10) Ensure that all persons operating the equipment are provided with and wear appropriate personal protective equipment (PPE). Where PPE is required, signage shall be posted in the work area, and/or provided in work instructions.
- 11) Ensure that all persons working with machines and power tools follow department developed work procedures.

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Equipment, Machine and Power Tool Users

- 1) Participate in appropriate training to work safely with equipment, machines and power tools.
- 2) Review and be familiar with applicable work procedures before start of work.
- 3) Follow OK TO START before starting equipment, machine, power tools.
- 4) Inspect any equipment for defects prior to its use.
- 5) Do not operate if any abnormality is detected, till it is rectified and declared fit to use by authorized persons.
- 6) Operate the machines and power tools according to work procedures
- 7) Follow safety procedures and use equipment and/or PPE as defined in the work procedure.
- 8) Practice good housekeeping and hygiene
- 9) Where requested, assist supervisors in identifying situations with potential of machine hazards and participate in the development of the Risk Assessment/HIRA or work procedure.

HSE Dept.

- 1) Provide consultation and assist in machine safety as and when required.
- 2) Update and maintain Guidelines on a regular basis.

Accountability:

Managers are accountable for ensuring this standard is fully implemented. In the event that any site is unable to meet any specific element in this standard, a formal concession must be requested from the manager approval of concession can be permitted by the executive committee.

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Appendix-1 Category of Hazards Associated with operation of Machinery

Appendix-2 Control of Hazards from Machine Operations

Appendix-3 General Machinery and Equipment Hazards and Controls

Appendix-1

Category of Hazards Associated with operation of Machinery

Mechanical hazards

Machinery and equipment have moving parts. The action of moving parts may have sufficient force in motion to cause injury to people. When assessing machinery and equipment for possible mechanical hazards, consider the following:

- Machinery and equipment with moving parts that can be reached by people.
- Machinery and equipment that can eject objects (parts, components, products or waste items) that may strike a person with sufficient force to cause harm.
- Mobile machinery and equipment, such as forklifts, pallet jacks, earthmoving equipment, operated in areas where people may gain access
- Common mechanical hazards and associated risks for machinery and equipment are shown below –

	Hazard			Risk
Rotating shafts, pullies, sprockets and		Er	tanglement	
gears				
Hard surfaces mo	ving together	Cr	ushing	
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Scissor or shear action	Severing	
Sharp edge – moving or stationary	Cutting or puncturing	
Cable or hose connections	Slips, trips and falls (e.g. oil leaks)	

Non-Mechanical hazards

Non-mechanical hazards associated with machinery and equipment can include harmful emissions, contained fluids or gas under pressure, chemicals and chemical by-products, electricity and noise, all of which can cause serious injury if not adequately controlled. In some cases, people exposed to these hazards may not show signs of injury or illness for years. Where people are at risk of injury due to harmful emissions from machinery and equipment, the emissions should be controlled at their source. When assessing machinery and equipment for possible non-mechanical hazards, consider how machinery and equipment can affect the area (environment) around them. Common non-mechanical hazards are shown below -

Non-Mechanical Hazard				
Dust	Mist (vapors or fumes)			
Explosive or flammable atmospheres	Noise			
Heat (radiated or conducted)	Ignition sources (flame or spark)			
High intensity light (laser, ultraviolet)	Molten materials			
Heavy metals (lead, cadmium, mercury) and gases	Chemicals Steam Pressurized fluids			
Ionizing radiation (x-rays, microwaves)	Electrical			

Access hazards

Operators must be provided with safe access that is suitable for the work they perform in, on and around machinery and equipment. A stable work platform, suited to the nature of the work that allows for good ergonomic posture relative to the work performed, sure footing, safe environment and fall prevention (if a fall may occur), is a basic requirement. For example, cooling towers on building roofs may have poor access, yet must be attended by a service person at predictable times for water treatment, chemical dosing or monitoring of automated dosing equipment. People performing these tasks must be provided with the means to get themselves and any equipment they require onto the roof with no risk, or minimal risk of fall or injury.

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When thinking about safe access to machinery and equipment, consideration given on the following points –

- Who will be working on or around the machinery and equipment.
- People who are required to work in enclosed areas where the atmosphere could be harmful, such as pits, tanks or storage vessels.
- What equipment or materials need to be carried to undertake the task.
- Where and when is access required for operation, maintenance and cleaning. How will people gain safe access (walkway, elevated work platform or ladder)
- · What work will be carried out during access.
- Will people be near or exposed to an unidentified mechanical or nonmechanical hazard at the time of access
- Has consultation occurred with workers or contractors regarding how they intend to gain access, and what equipment and work platform or structure is best suited for the intended task.

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Control of Hazards from Machine Operations

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At Himadri Speciality Chemical Limited the following steps were opted to reduce machine hazards-

- A. Hazard Identification
- B. Work Procedures
- C. Training
- D. Emergency Preparedness

A: Hazard Identification - A workplace hazard is any equipment, procedure, material, environment or situation that may cause personal injury or illness, or property damage. Workplace hazards need to be anticipated, identified, and evaluated based on the degree of risk and exposure. Once the hazards have been identified and evaluated, appropriate control measures should be implemented to minimize the likelihood of injury in the workplace. Some common machine hazards and genera safety measures include –

- a. General Machinery and Equipment Hazards and Controls
- b. General Metalworking Machine Safe Practices
- c. General Woodworking Machine Safe Practices
- d. Powered Hand Tools
- e. Specific Equipment Hazards
- f. Ergonomics, Material Handling and Storage
- g. Machine Shop Work Environment

This above list is not exhaustive of all the hazards that may be present in machine shops or when working with machines. Supervisors/Line Manager must determine if there are any additional hazards that may be present. This can be achieved by completing a Risk Assessment /HIRA for tasks involved where necessary

B: Work Procedures

Each workplace is different and has different hazards. Based on the hazards identified above, written work procedures should be provided to machine users on the work they are expected to perform, how to perform this work safely, and what types of tools or PPE they may need to perform this task. This includes work activities that may occur every day, maintenance that occur periodically (e.g. monthly, annually), and emergency procedures. Here are some examples of work procedures that can be developed:

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- 1. Procedures on using, inspecting and maintaining equipment (machines, power tools) in some cases, additional workplace procedures (such as Lock Out/Tag Out procedures) may be required to supplement manufacturer manuals/instructions.
- 2. Procedures on handling, mixing, storing and disposing of chemicals and materials used with the machines.
- 3. Procedures on the orientation of machine users (training requirements, PPE, etc.)
- 4. Procedures for ergonomic aids (e.g. pallet hand trucks).
- 5. Procedures for emergency response and injury reporting.

C: Training -

Based on the above, appropriate training should be provided as follows:

- 1. Equipment specific training. Training should be provided on the safe use of equipment and tools, to include routine operations, storage, maintenance and the use of protective devices such as guards, interlocks, two-hand controls, electronic sensing devices, push sticks, emergency stops. Where PPE is required, training should be provided on the proper use and maintenance of the PPE.
- 2. Additional hazard specific training, such as (but not limited to):
 - Ladder safety
 - Lock Out/Tag Out
 - · Manual Materials Handling
 - Noise
 - Respiratory Protection
 - Working in Hot/Cold Environments
- 3. Worksite specific training, such as emergency preparedness (i.e. where to find emergency equipment, eye wash, first aid kits, fire extinguishers, emergency contact, etc.)
- 4. In addition to formal training such as the online or instructor-led courses, supervisors can also take the opportunity to review department- or work-specific procedures for working with machines (or other health and safety requirements) in other forums such as toolbox talks, operations meetings, hands-on demonstrations, etc.

D: Emergency Preparedness

Users of the machines and power tools should know the location of and how to use any emergency equipment that may be in the area such as first extinguishers, first aid

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kits, eye wash stations or showers and alarms. Elements of emergency preparedness may include the following:

- · First aid stations are available, easy to identify.
- First aiders are identified and fully trained. Generally, a list of contacts and phone numbers are posted near the First Aid Station.
- A list of emergency numbers should be posted or available. Fire alarms and emergency exits are visible and accessible.
- Emergency Exits and stairs are kept clear of clutter and obstacles.

Appendix-3

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General Machinery and Equipment Hazards and Controls

Several general types of hazards exist on many types of machinery. Machine parts generally move in one of three ways: they rotate, they slide, or they can rupture, fragment, and/or eject. Shop and machine users must be provided protection from these hazards:

Point of Operation: Refers to the area where work (e.g. cutting, shearing, shaping, boring) is performed on a stock material.

Nip or Pinch Point: Refers to an area other than a point of operation where a belt contacts a pulley or where one or more rotating parts come together, and it is possible for a part of the body to get nipped or pinched by moving parts.

Power Transmission: Refers to areas where power is transferred from one part to another such as a drive shaft, belt, pulleys, sprockets, gears, couplings or chains.

Machine Safety Controls

Many control systems exist to provide protection from hazards. Users must be provided protection from all hazards during their work with a machine. When selecting a safeguard or combination of safeguards, start at the top of the hierarchy:

- Elimination/Substitution,
- Engineering controls,
- Administrative controls, and PPE.

Most effective control is to either elimination or substitution (e.g. eliminate human interaction in the process, eliminate pinch points, and automate material handling). This may not always be practicable.

Next in the hierarchy of controls, in terms of most effective, are engineering controls. Where elimination or substitution is not possible, engineering controls must be given priority. If engineering controls are not feasible, then an appropriate administrative control must be used. If an administrative control will not control the hazard, then PPE must be utilized. A combination of control measures may be required to eliminate or minimize the risk, and can include:

- · Guarding (fixed or interlocking)
- Appropriate Ventilation (local exhaust ventilation, dust collection systems)
- Devices to prevent body part contact (push stick, holding device, two-handed activation controls)

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- Visible and accessible stopping mechanism (emergency stop)
- Barriers, sensors, signs and alarms (fixed area barriers, visible lights, signage on machines/area, horns and sirens, restricted space painted on floor)
- Preventative inspections/testing (pre-use testing and inspection, documented annual service/maintenance)
- Safe work procedures, LOTO
- PPE (safety footwear, eyewear, hand protection, face shields, hearing protection, respirators)

The most effective safeguard is a device or system that provides the maximum protection with the minimum impact on normal machine operation.

A. Engineering Controls

Engineering controls include guards, controls, general ventilation, local ventilation, and dust collection systems.

Machine Guards

Where machine equipment has an exposed moving part, an in-running nip hazard, or material being processed in a way that creates a hazard, the machine should be equipped with a guard or other device that prevents access to the moving part or pinch point. There are three main types of barrier guards that physically prevent a worker from reaching around, over, under, and through the guard to the danger area. At least one type of guard can provide protection from most machine hazards.

Fixed Guard: refers to a guard that is a permanent part of the machine, but is not dependent upon moving parts of the machine to perform its guarding function. A fixed guard that can be manually set into the appropriate position before machine operation is sometimes referred to as an "adjustable guard". A fixed guard that completely separates the user from the hazard is often called an "enclosed guard". Fixed barrier guards must be secured with at least one fastener requiring a tool for removal.

Interlocked Guard: refers to guards that are connected to a mechanism that cuts power to the machine when the guard is tripped or moved out of position. This allows

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the guard to be moved for the user to access the point of operation and disables the control system until the guard is put back in place and the control system reset.

Self-adjusting Guard: refers to a guard that adjusts automatically to the thickness and movement of the stock material. Where barrier guards are impracticable, other safeguarding devices can be considered. This can include two-hand controls, interlocked gate guards, presence-sensing devices (light curtains), restraint device, speed limiters, and so on.

Assist when reviewing what safe guarding devices would be most effective for the equipment:

Machine Controls

Machine controls, should be conspicuously identified and, located in a safe position and within easy reach of the operator. Emergency or 'E-Stop's is a red mushroom shaped stop manually depressed in the event of an emergency condition or accident. Emergency stops should not be considered a primary safeguarding device, as it requires intentional activation, and seldom prevents accidents. It should also be located within immediate and unimpeded reach of the operator, mushroom-shaped and red in colour and designed to allow immediate activation with any part of the body.

General Ventilation

All machine shops or areas where machines are used should be adequately ventilated. General ventilation systems are not substitutes for local ventilation where local ventilation is required.

Local Ventilation - Where processes may produce dust, mists, fumes, or vapours which may be hazardous or may form explosive mixtures, local exhaust ventilation should be used to remove the hazardous material. For instance, when chemical or flammable liquid work is performed, additional ventilation may be required in addition to the building general ventilation. This may include fume hoods or other types of local exhaust ventilation.

Dust Collection Systems- Dust collection systems remove sawdust or other particles from the shop or work area. The particles are generally collected in a bag or other

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container for disposal. Where woodworking or other dust generation activities are conducted, it is recommended that an appropriate dust collection system be put in place. Dust collection systems must be properly maintained, and care must be taken in disposing of dust which may be toxic, flammable, or pose other hazards.

B. Administrative Controls/Work Practice -

Administrative controls include training, standard operating procedures, access control to machines and the shop, maintenance activities, and shop guidelines. Each shop/department should establish these guidelines, put them in writing, make them readily available, and post their location at the entrance to the shop.

Examples of Administrative controls include:

- Sensors, signs and alarms (restricted access, visible lights, signage on machines/area)
- Prevent body part contact (location separation, push sticks)
- Preventative inspections/testing (pre-use testing and inspection, documented annual service/maintenance)
- · Work Procedures, training and supervision

C. Personal Protective Equipment (PPE)

Personal protective equipment used in a machine shop and work sites may depend on the specific equipment and materials used, and will include:

- Helmet
- Eye protection
- Hearing protection
- Nose mask
- Hand gloves
- Safety Shoes
- Face shield
- Welding Gears
- Special PPE (in any)

D. Entanglement Hazards

It is dangerous to have any objects or clothing on the body that may get entangled when working around moving machinery parts. Avoid loose clothing, gloves,

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unconfined long hair and jewelry which can potentially get caught in moving parts and may led to serious injuries or fatalities.

- Clothing
- · Be familiar with the HSE Protective Clothing Standard
- Wear close-fitting clothing.
- Tuck shirts into the pants.
- If long-sleeved shirts are worn and required for protection, make sure to button any cuffs at the wrist. If long-sleeved are not required, wear short-sleeved shirts.
- Hand Gloves
- Be familiar with the HSE Hand Protection Standard
- Wear suitable hand gloves identified by your supervisors when working near rotating parts, shafts or other moving machinery parts.
- Long Hair and Jewelry
- Tie back long hair, wear it in a bun, or cover it with a cap.
- Keep facial hair short or tie/secure long facial hair to prevent entanglement with machinery parts.
- If you are not sure if your hair/facial hair is safe, speak with your supervisor.
- Do not wear jewelry (i.e. rings, necklaces, bracelets) when working with machines with moving parts.

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TITLE: Vehicle Management Standard

Vehicle Management Standard

Purpose:

Himadri Speciality Chemical Limited (HSCL) implemented this policy considering minimum requirements for the safe operations of vehicles which include any equipment or machinery used for moving people or materials within the plant premises, whether operated by Company's employees or by contractors. The main aim is to minimize risk of coactivity or collision between vehicles and between vehicles and pedestrians.

Scope:

This standard is applicable to all **Light Motor Vehicles- LMV** (cars, tempos, forklift trucks, mini trucks) and **Heavy Motor vehicles- HMV** (trucks, containers, tankers, tyre mounted excavators), operated by Company's employees or by contractors who are directly and indirectly supervised by Company including visitors. It applies to Company's manufacturing plants premises, warehouses, R&D centers, and locations controlled by Company.

Vehicles operations

- All vehicles must be roadworthy.
- Vehicles must comply with local laws and regulations, particularly as these apply to the transport of hazardous materials.
- Vehicles must be subject to an appropriate pre-operation safety check.
- A formal inspection and preventative maintenance system must be in place to ensure that vehicles are maintained in a safe and roadworthy condition.
- The driver and all passengers must wear their seat belts at all times.
- The drivers of heavy equipment and those driving in areas of heavy equipment activity must undergo induction and training covering the specific hazards pertaining to their role and must be authorized as competent.
- A detailed Risk Assessment is required to make an Internal traffic rule.
- Maximum speed limit:
 - 10 km/h for vehicles outside buildings for vehicles, excluding lifting equipment.
 - 10 km/h for lifting equipment outside buildings and inside buildings 7 km/h
- Mobile phones are strictly prohibited whilst driving any vehicle.
- Cars must be parked in reverse direction.
- Pedestrian Walkway shall be clearly defined and separated from vehicle movement zones.

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