LTI reduction
Machine Protection - Machines

List of topics related to «Machines»

Matters about Machines:

Existing machines:

- Oldest machines than 10 years ago
- Modern machines (provide with interlocks and fool proof systems to protect pleople during the operation or maintenance)

New acquisition machines:

- Actual requirements to buy new machines or instalations
- Automation, use of machinery in place of people

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HIRA Concept applied at machines

- A HIRA must be applied to all conditions where a serious and imminent risks are evidenced to health or physical integrity of workers from the machinery or equipment only when the situation.
  - Hierarchy to became machine safely:
    - Elimination
    - Replacement
    - Re-engineering
    - Safety guard installation
    - PPE
- Compliance with local Laws requirements

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- Protect machine must be considered in all phases:
  - Conception/project,
  - construction,
  - transportation,
  - Assembly or dismantling
  - installation,
  - tests
  - adjustment,
  - operation,
  - cleaning,
  - maintenance,
  - inspection,.

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Physical layout and facilities:

- At the installation sites of machinery and equipment, the circulation areas shall be properly marked and in accordance with the official technical standards.
- The main traffic routes in the workplaces and those that leading to exits shall be a proper space to prevent a safety route, according the local/ country legislation.
- The circulation areas shall be kept permanently clear. (Proper housekeeping)
- The materials in use at the production process shall be allocated in specific areas of storage,
- The minimum distance between machinery, in accordance with their characteristics and applications, shall ensure workers' safety during operation, maintenance, adjustment, cleaning and inspection, and to permit the movement of body segments, due to the nature of the task.
- The floors of workplaces where are installed machinery and equipment and circulation areas shall:
  - be kept clean and free of objects, tools and any materials that have risks of accidents;
  - have characteristics to prevent risks from grease, oils and other substances and materials that make

  them slippery; and
  - be leveled and resistant to the loads they are subjected.
  - The level of noise should be considered in order to be installed a protection taking into acccount the worker’s health, according to local legislation

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- Stationary Machines:
  - **The stationary machinery shall have preventive measures regarding its stability, so the machines does not swing and does not move unexpectedly due to vibration, shock, predictable external forces, internal dynamic forces or any other accidental reason.**
  - **The installation of stationary machinery shall comply with the requirements provided by the manufacturers or, missing these, the project prepared by a legally qualified professional, in particular on the foundation, mounting, cushioning, leveling, ventilation, electrical, pneumatic and hydraulic power, grounding and cooling systems.**

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- Moveable Machines:
  - **moveable machines that have rotations, shall have locks and or interlocks.**
  - **The machines, the circulation areas, worksites and other locations where there may be workers shall be positioned so that no aerial transport and handling of materials occurs on the workers.**

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Installations and electrical devices:

- **The electrical installation of machinery and equipment shall be designed and maintained in order to prevent, by safe means, the risks of electrical shock, fire, explosion and other accidents, as on teh local legislation or international standards.**
- **They shall be grounded, according to current official technical standards, the installations, casings, housings, shielding or conductive parts of machinery and equipment that are not part of electrical circuits, but that may be under voltage.**
- **The electrical installation of machinery and equipment that are or may be in direct or indirect contact with water or corrosive agents shall be designed with means and measures to assure their shielding, tightness, insulation and grounding, in order to prevent accidents.**
- **The power lead of machinery and equipment shall meet the following minimum safety requirements:**
  - **provide mechanical strength commensurate with its use;**
  - **have protection against the possibility of mechanical failure, abrasive contacts and contact with lubricants, fuel and heat;**
  - **located so that no segment is in contact with moveable parts or sharp edges;**
  - **facilitate and not obstruct the transit of persons and materials or the operation of machinery;**
  - **does not offer any other types of risks on your location;**
  - **be made of materials that do not propagate the fire, i.e., self-extinguishing, and that do not emit toxic substances in case of heating.**

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Installations and electrical devices:

- **Power**
  - **The power enclosure of machinery and equipment shall meet the following minimum safety conditions / requirements:**
    - **have access door, kept permanently closed;**
    - **have signs about the danger of electrical shock and restricting access by unauthorized persons;**
    - **be maintained in good conservation state, clean and free of objects and tools;**
    - **have protection and identification of circuits; and**
    - **meet the appropriate degree of protection as a function of the usage environment.**

- **Starting, actuation and stop devices**
  - **The starting, actuation and stop devices of machinery shall be designed, selected and installed so that they:**
    - **are not localized in their hazardous areas;**
    - **can be activated or turn off in case of emergency by a person other than the operator;**
    - **prevent inadvertent actuation or shutdown by the operator or any other accidental way;**
    - **do not provide additional risks; and**
    - **cannot be juggled / jumped.**
  - **The starting or actuation commands of the machinery shall have devices to prevent their automatic operation when energized.**
  - **When actuation devices of bimanual control type are used in order to keep the operator's hands off the danger zone, they shall meet the following minimum requirements for the control**
    - **The bimanual control devices shall be placed at a safe distance from the danger zone, taking into account: arrangement and response time of the bimanual control device; the maximum time required for the machine stoppage or to danger removal, after the end of the output signal of the bimanual control device; and projected utilization for the machine.**

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Safety systems:

- **Danger zones of machinery and equipment shall have safety systems, characterized by fixed protections, moveable protections and interconnected safety devices to ensure protection to health and physical integrity of workers;**

- **The adoption of safety systems, particularly in the areas of operation that shows danger;**

- **The safety systems shall be selected and installed to have safety category in accordance with previous risk analysis provided by HIRA;**

- **installation so that cannot be neutralized or juggled;**

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Safety Guards:

- fixed protection, which shall be kept in its permanent position or by means of fixing elements which allow their removal or opening with the use of specific tools only;
- moveable protection, which can be opened without the use of tools, usually by mechanical elements connected to the machine structure or a near fixed element, and shall be joined with the interlocking devices.
- Protection against hot surface and electrical parts

Safety Devices:

- electrical controls and safety interfaces: devices responsible to perform the monitoring, that verifies the connection, position and operation of other system devices and prevent the occurrence of a failure that causes the loss of safety function, such as safety relays, safety configurable controllers and safety programmable logic controller – PLC;
- interlocking devices: electromechanical safety switches, with positive and break action, magnetic and electronic coded, optoelectronics, safety inductive sensors and other safety devices that have the purpose of preventing the operation of machine elements under specific conditions
- safety sensors: mechanical and no-mechanical presence detectors devices, that act when a person or part of your body penetrate the danger zone of a machine or equipment, sending a signal to stop or prevent the start of hazardous actions such as light curtains, optoelectronics presence detectors, laser of multiple beams, optical barriers, area monitors or scanners, stops, carpets and position sensors
- valves and safety blocks or pneumatic and hydraulic systems with the same effectiveness;
- mechanical devices, such as: restraint devices, limiters, separators, pushers, inhibitors, baffles and retractable;
- validation devices: supplementary hand-operated control devices, that when applied on a permanent mode, enable the actuation device, such as lockable switches and lockable devices.

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Emergency devices:

- **The machinery shall be equipped with one or more emergency stop devices, through which be avoided latent and existent danger situations;**
- **The emergency stop devices shall not be used as starting or actuation device;**
- **The emergency stop devices shall be positioned in locations of easy access and viewing by the operators in their worksites and by other persons, and kept permanently clear;**

Pressurized components:

- **Shall be adopted additional protection measures of hoses, piping and other pressurized components subject to possible mechanical impacts and other aggressive agents when there is risk;**
- **Hoses, piping and other pressurized components shall be located or protected so that a situation of rupture of these components and fluid leaks cannot cause accidents of work;**
- **The machinery pressurized systems shall have means or devices intended to ensure that:**
  - **the maximum allowable working pressure in the circuits cannot be exceeded;**
  - **progressive or abrupt pressure drops and vacuum loss can not generate danger.**
- **When the machine's energy sources are isolated, the residual pressure of reservoirs and similar containers, such as hydro pneumatic accumulators, cannot create a risk of accidents;**

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Maintenance, inspection, preparation, adjustments and repairs:

- **The machinery and equipment shall be subjected to preventive and corrective maintenance in the manner and frequency determined by the manufacturer according to current official national technical standards and, missing those, international technical standards;**
- **The preventive maintenances with the potential to cause accidents at work shall be subject to planning and management performed by a legally qualified professional**
- **The preventive and corrective maintenance shall be recorded in own book, index card or information system, with the following data:**
  - **maintenance schedule;**
  - **interventions performed;**
  - **date of completion of each intervention;**
  - **service performed;**
  - **parts repaired or replaced;**
  - **safety equipment conditions;**
  - **conclusive indication for the machine safety conditions; and**
  - **name of the person responsible for performing of interventions.**
- **The record of maintenance shall be available to the workers involved in operation, maintenance and repairs;**
- **The maintenance, inspection, repairs, cleaning, adjustments and other interventions that are necessary shall be performed by trained, qualified or legally skilled professionals, formally authorized by the employer, with machinery and equipment stopped;**
- **Insulation and discharge of all energy sources of machinery and equipment, in a visible manner or easily identifiable by means of the control devices;**
- **A LOTO – Lock Out, Tag Out system is mandatory during all time when the machineries are in maintenance, including restraints systems with mechanical lock to prevent accidental back movement of tilted or articulated open parts of the machinery and equipment.**