

# Safe Practices for Robotics in the Workplace

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**PRACTICES** OSHA, Labor and Employment

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Use of industrial robots to perform repetitive activities such as material handling, assembly, loading and unloading product is common in many workplaces today. While robots promote efficiency, they may create new hazards in the workplace that require attention from employers. An appropriate robotic safety system is essential to protect employees who program, operate, maintain and repair robots, and others who could be exposed to hazards associated with a robot's operation.

Guidance for safe use of robotics is available from multiple sources. The standards of the American National Standards Institute, such as ANSI R15.06, provide guidelines for safe use of robots. While there are no OSHA standards that are specific to use of robotics in the workplace, the OSHA website provides abundant guidance on safely working with robots. See, e.g., [Guidelines for Robotic Safety](#). Employers might benefit from referring to these sources when implementing and using robotic equipment in the workplace.

To minimize potential for injuries to employees, employers should consider the following practices when using robotic equipment in the workplace:

**Hazard analysis:** Prior to using a robot in the work place, hazard analysis should likely be performed to identify potential safety hazards created by the robot. The hazard analysis should consider factors such as the tasks to be performed by the robot, the start-up and the programming procedures, the robot's work environment, possible malfunction, corrective actions needed to maintain normal operations and potential human errors in working with the robot. A robotic safety system should be developed based on the hazard analysis of the specific robot to be used in the workplace.

**Guarding of robots:** A robot's immediate work space, known as the robot's work envelope, may need to be physically segregated, such as with a fence, from areas where employees work. To ensure safety of employees, physical barriers should be coupled with guarding systems such as one in which all robotic operation automatically stops if a gate into the fenced area is opened. Another means of guarding could be use of pressure sensitive floor mats in the robot's work envelope that would detect a person's presence in the area and suspend all robotic operation. In addition, audible and visible warning systems may be used to alert employees if they enter the fenced area.

**Control devices for robots:** The main control panel of a robot should likely contain one or more emergency stops such that the robot can be fully stopped without the need to enter the work envelope. Ideally, there should be multiple means of stopping the robot, all of which should be readily accessible and in plain view. Emergency stops should be designed to override all other controls. Controls that energize or start the robot must be constructed in a manner that guards against accidental operation. All control systems must meet the OSHA standards for electrical equipment.

**Robotic safety policy:** Employers should consider a written robotic safety policy for working in the

robotic environment. The policy could require regular inspection of the robots and training for all employees including periodic refresher training. Unauthorized/untrained personnel should not be permitted to work in a robotic environment. Managers and supervisors should be knowledgeable enough to enforce the safety policy and procedures for safe work practices in a robotic work environment.

**Training for working with robots:** Employees should generally be familiar with the tasks the robot is expected to perform, potential malfunctions and appropriate response actions to ensure employees' safety. Such training should also include familiarity with emergency stops for the robot and the robotic system's potentially hazardous energy sources. To the extent an employee needs to enter a robot's work envelope while the robot is energized, training should be provided in the use of slow robot operation speeds and hazardous location avoidance until the work is completed. In addition to being trained in the proper operating and control procedures of the robot, the robot operators should likely be trained to recognize robotic malfunction, the resulting hazards and implementing the appropriate corrective/response actions to control/eliminate the hazard.

An employer's actual hazard analysis and specific robotic systems may change the above suggestions or require additional measures. The key is to at least consider how current safety regulations apply to an employer's use of robotics.