



Weekly Safety Meeting

Preventing the Injury of Workers by Robots

The Occupational Safety and Health Administration (OSHA) does not currently have a designated standard for the robotics industry. However, we do have direction from the National Institute of Occupational Safety and Health (NIOSH), American National Standard Institute (ANSI), the International Organization for Standardization (ISO), Canadian Standards Association (CSA), and American Welding Society (AWS), which all have specifications for robots in Industrial settings and robot systems.

Unfortunately, there are many stories of operators becoming victims to the operation of robots, resulting in fatal incidents. One background story includes where a victim entered the working range of the operating robot, presumably to clean up scrap metal that had accumulated on the floor. Despite training in a robotics course, instructions on the job, and warnings by fellow workers to avoid this dangerous practice, the victim apparently climbed over, though, or around a safety rail which surrounded two sides of the robot's work envelope. The entry point in the safety rail was interlocked. No other presence-sensing devices were operative in the system.

In this case, the victim was trapped between a fixed object (steel pole 4 inches in diameter) and the active back end of the robot, which was outside the working zone of the robotic arm. The worker apparently presumed this area to be "safe."

According to the Centers for Disease Control and Prevention website, detailing recommendations from NIOSH, this incident was preventable and demonstrated a growing problem of the failure of workers to recognize all the hazards associated with robots.

While workers may readily recognize hazards associated with the working zone of a robotic arm, they may not recognize dangers associated with the movement of other parts of the robotic assembly.

Recommendations By NIOSH

To minimize the risk of such incidents, NIOSH offers the following recommendations regarding the design of robotic systems, the training of workers, and employee supervision.

The Design of a Robotic System

Regarding both existing robotic equipment and new designs, NIOSH recommends the following with respect to robotic systems:

- Include physical barriers that incorporate gates equipped with electrical interlocks so that operation of the robot stops when the gate is opened;
- Include, as a backup to electrical interlocks, motion sensors, light curtains, or floor sensors that stop the robot whenever a worker crosses the barrier;
- Provide barriers, as may be appropriate, between robotic equipment and any freestanding objects such as posts limiting robot arm movement so that workers cannot get between any part of the robot and the “pinch points”;
- Provide adequate clearance distances around all moving components of the robotic system. It is of particular importance that this be considered in plans for replacing a human worker with a robot; a robot often requires more operational space than does a human worker doing the same task;
- Include remote “diagnostic” instrumentation as much as possible so that the maximum amount of troubleshooting of the system can be done from areas outside the operating range of the robot. Whenever it is necessary for a worker to be within the operating range of a robot, additional special provisions for safety should be taken, including, at a minimum, the presence of another worker who can turn off the robot should an emergency develop (buddy system);
- Provide adequate illumination in the control and operational areas of the robotic system so that written instructions, as well as buttons, levers, etc., are clearly visible; and
- Include on floors or working surfaces clearly visible marks that indicate the zones of movement of the robot.

Worker Training

We must provide training to the specific robot in question, if a worker will be involved in programming, operating, or maintaining robots. Moreover, we should be providing refresher courses which re-emphasize safety and discuss new technological developments for experienced programmers, operators, and maintenance workers. This training should emphasize safe work practices and stress the following:

- Workers must be familiar with all working aspects of the robot, including full range of motion, known hazards, how the robot is programmed, emergency stop buttons, and safety barriers before operating or performing maintenance work at robotic workstations;
- Operators should never be in reach of the robot while it is operating; and
- Programmers, operators, and maintenance workers should operate robots at reduced speeds consistent with adequate worker response to avoid hazards during programming and be aware of all conceivable pinch points, caught between locations, such as poles, walls, and other equipment, in the robot’s operational area.

Supervisor Responsibilities

Supervisors should do the following with regard to protecting workers from robotic equipment:

- Assure that no one is allowed to enter the operational area of a robot without first putting the robot on “hold,” in a “power down” condition, or at a reduced operating speed mode; and

- Recognize that with the passage of time, experienced workers doing automated tasks may become complacent, overconfident, or inattentive to the hazards inherent in complex automated equipment. Close supervision and auditing inspections of such operations is imperative to assure safety and reinforce the seriousness of these kinds of operations.

Summary:

These are NOT OSHA regulations. However, they do provide guidance from their originating organizations related to worker protection.

ROBOTS ARE SERIOUS BUSINESS!

Safety Meeting Sign-In Sheet

Supervisor:	Subject:
Location:	Date:
Conducted By:	Trainer Signature:

Name (print clearly)	Signature	Comments / Safety Concerns / Training Requests