

Robot Safety

Industrial Robots

- “Programmable multifunctional mechanical devices designed to move materials, parts, tools, or specialized devices through variable programmed motions to perform a variety of tasks.”
- Robots are generally used to perform:
 - unsafe
 - hazardous
 - highly repetitive
 - unpleasant tasks .

..so that human workers don't have to

Robot Accidents

- Many robot accidents do not occur under normal operating conditions, but rather during programming, maintenance, repair, testing, or adjustment.
- Robots are capable of high-energy movements through a large volume of space, posing great hazard.

Robot Accidents

- Types of Accidents:
 - **Impact or Collision Accidents:**
 - Unpredicted movements, component malfunctions, unpredicted program changes related to the robot's arm or peripheral equipment.
 - **Crushing and Trapping Accidents:**
 - A worker's limb or other body part can be trapped between, or crushed by, a robot's arm and other peripheral equipment.
 - **Mechanical Parts Accidents:**
 - The breakdown, release, or failure of parts.
 - **Other Accidents**

Robot Hazards

- Sources of Hazards:
 - Human Errors
 - Control Errors
 - Unauthorized Access
 - Mechanical Failure
 - Environmental Sources
 - Power Systems
 - Improper Installation

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- Employee #1, a 38-year-old male employee with Sodecia Sterling Heights, was inside a robot work cell with the interlocked gates closed
- Employee #1 was struck from behind by a transfer robot, crushing his chest and neck
- Employee was killed in the event.
- Employee #1 had lock attached to his belt loop - i.e. he did not lock out before beginning maintenance.

Safeguarding Personnel

- Risk Assessment
 - should be performed at each stage of development of a robot system to determine the appropriate level of safeguarding
- Safeguarding Devices
 - limiting devices, sensors, fixed barriers, interlocked barrier guards
- Awareness Devices
 - chain or rope barriers, flashing lights, signs, whistles, horns
- Safeguarding the Teacher
 - restricting robot speed during programming in “teach” mode

Safeguarding Personnel

- Operator Safeguards
 - operator should be outside the robot's restricted zone at all times
- Attended Continuous Operation
 - when a person is in a robot's restricted envelope, the robot should be at slow speed and in "teach" mode
- Maintenance and Repair Personnel
 - perform repairs with robot in manual or "teach" mode
- Safety Training
 - personnel should be able to demonstrate their competence to operate robot systems safely