

Working with and around Robots

Mindfulness Minute: Consider the hazards and possible safety measures to incorporate while operating and working with robots

Robots are becoming more common in industrial operations. While beneficial to improving efficiency and removing humans from certain high-hazard situations, working with robotic devices can introduce new hazards to the workplace. It is important to be aware of, anticipate, mitigate, and minimize any hazards that may become apparent while working with robots. By assessing the risks involved and managing these hazards, we can help foster a safe environment to work with and around robotic devices.

Robots

While robots have functioned in the workplace for many years, there has been a recent demand to increase the presence of robots in industrial operations for improved efficiency. Additionally, human-robot interactions in healthcare and other workplaces offer potential for general quality-of-life improvements. The increase in robot utilization has subsequently led to a rise in robotics research. When working with or around robotics, there are some safety considerations that can be employed to minimize any relative risk.



UTK is expanding its research in human-robot interactions – Photo from Dr. Zhao's lab studying robot interactions to help Alzheimer's patients

Hazards and Risks

When working with and around robots, it is important to consider the hazards and relative risks they may pose to those working directly with the machinery, as well as observers and bystanders. Some hazards that are involved with robot operations include but are not limited to:

- Impact, collision, or struck-by/caught-between hazards
- Crushing and trapping
- Electrical/high energy hazards
- Slipping, tripping, and falling where spills or leaks (oil, hydraulic fluids, etc.) occur, as well as power cables and hoses

Safety Considerations

To minimize the risks and avoid hazards associated with working with and around robots, consider these safety measures:

- Ensure machine guarding/safeguarding is implemented, such as presence-sensing devices and barrier guards during operation
- Prevent unauthorized access to robot working space as much as possible
- Create device awareness by installing chain or rope barriers, along with flashing lights and whistles or horns, around the robot operating area
- Safeguard those working around or with the machine by reducing speed while programming/in contact with the robot
- Write procedures and SOPs specific to the robot(s) in operation and train those who routinely work with the robotic system
- Wear appropriate personal protective equipment (PPE) around robot(s) during operation, such as steel toe/composite toe boots, safety glasses, etc.

Designer Impact Integrator Impact User Impact	1	Inherently Safe Design Measures	Elimination Substitution Limit interaction
	2	Safeguarding and Complementary Protective Measures	Safeguards & if applicable, Safety-Related Parts of the Control System (SRP/CS) e.g. safety functions Complementary Protective Measures • Emergency stop devices and functions • Platforms and guard railing (fall prevention) & safe access – building codes & standards can apply • Measures for escape & rescue of people, isolation & energy dissipation, handling heavy parts
	3	Information for Use	Warnings & Awareness Means Administrative Controls Personal Protective Equipment

3-step hierarchy of controls is the current industrial robot safety standard

References

OSHA Technical Manual (OTM) Section IV: Ch. 4 – Industrial Robot Systems and Industrial Robot System Safety: <https://www.osha.gov/otm/section-4-safety-hazards/chapter-4#safety>

NIOSH Robotics in the Workplace: An Overview: <https://www.cdc.gov/niosh/robotics/about/>