

# Exoskeletons Safety Fact Sheet

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**W**earable robotic devices, known as **industrial exoskeletons**, help workers lift, reach, and move with less strain. These systems support the body's natural motion and reduce fatigue during physically demanding work. They now appear in **construction, manufacturing, logistics, warehousing, and health care**, where they can boost productivity and lower injury risk.

However, exoskeletons also introduce **new safety challenges**. Proper training, fit, and maintenance keep workers safe and help employers comply with **Occupational Safety and Health Administration (OSHA)** requirements for mechanical assistance and powered systems.

This fact sheet provides practical guidance for employers and workers on how to select, use, and maintain exoskeletons safely in the workplace.

## Exoskeleton safety tips

Use these safety tips to help your team work smarter and safer with exoskeletons:

- 1. Evaluate work tasks before introducing exoskeletons.**  
Assess job duties to identify where an exoskeleton provides real benefits. Choose devices that match the physical demands of the task — such as lifting, overhead reaching, or walking long distances. Avoid using exoskeletons for tasks that require twisting or bending in awkward positions. Conduct a **hazard assessment** to identify risks, including pinch points, trip hazards, or limited visibility.
- 2. Choose the right device for your workplace.**  
Select exoskeletons that meet your industry's safety standards and support your job requirements. Consider:



- **Task-specific selection:** Choose full-body or back-support models for heavy lifting, upper-body or shoulder supports for frequent overhead work, and lower-body or leg assists to reduce fatigue during long periods of standing or walking. Select the model that targets where workers need extra strength or support most.
- **Powered vs. passive systems:** Use powered systems — exoskeletons with motors, batteries, sensors, or hydraulics that actively assist movement such as lifting or posture support — only when workers are trained to manage moving parts and electrical hazards. Choose passive systems — those using springs, elastic bands, levers, or counterbalances — to reduce strain and fatigue by redistributing or absorbing the force of a load.
- **Environmental limits:** Follow manufacturer guidance for operating conditions. Exoskeletons can trap heat or overheat in hot environments, stiffen

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or lose battery performance in cold temperatures, and short out or corrode in wet or humid conditions.

- **PPE compatibility:** Confirm that the device integrates safely with personal protective equipment (PPE), such as hard hats, gloves, and fall protection gear.

### 3. Train workers before use.

Train every user and supervisor on safe operation, emergency procedures, and device limits. Training should cover:

- How to put on, adjust, and remove the exoskeleton.
- Recognizing signs of fatigue, overheating, or discomfort.
- Safe lifting techniques while using the device.
- When to stop work and report concerns.

Document all training sessions to meet OSHA's expectations for safe mechanical-assist device operation.

### 4. Fit and adjust for comfort and safety.

A proper fit reduces strain and prevents injuries. Adjust the exoskeleton's straps, harness, and supports to match each worker's body. Add padding where needed to prevent rubbing or pressure points. Have workers walk, bend, and reach to test range of motion. If the device restricts movement or shifts out of place, readjust it before resuming work

### 5. Monitor for fatigue and heat stress.

Exoskeletons add weight and can trap



body heat. Encourage frequent rest breaks, especially in hot environments. Watch for signs of **heat stress**, such as dizziness, nausea, or muscle cramps. Rotate tasks and remind workers to hydrate often.

### 6. Inspect and maintain equipment daily.

Check every exoskeleton before use. Look for:

- Cracked or worn components.
- Loose straps or fasteners.
- Battery or sensor malfunctions on powered systems.

Clean and store the device as directed by the manufacturer. Report and repair any problems immediately. Never use damaged or untested equipment.

### 7. Plan for emergency situations.

Create procedures for quickly removing an exoskeleton during an emergency, such as a fire, fall, or electrical hazard. Supervisors and coworkers should know how to help without causing further injury. Keep first aid kits and emergency contact information close to work areas.

### 8. Integrate exoskeleton safety into your overall safety program.

Treat exoskeletons like any other piece of equipment. Include them in your job hazard analysis, ergonomic assessments, and preventive maintenance plans. Update your workplace safety procedures to cover their use and inspection.





When selected, fitted, and used correctly, exoskeletons can significantly improve ergonomics, reduce fatigue, and prevent overexertion injuries. They help employees perform demanding work more safely and efficiently, but these benefits depend on proper training, fit, and monitoring. Continuous evaluation ensures exoskeletons enhance — not hinder — worker safety and health.

## Potential risks and considerations

Even well-designed exoskeletons can pose hazards if improperly selected, fitted, or maintained. Watch for:

- **Pressure injuries:** Poorly fitting exoskeletons can cause skin abrasions or soft-tissue irritation.
- **Increased chest pressure:** Some models may compress the chest, posing risks for workers with pre-existing conditions.
- **Heat stress:** Added weight and insulation can increase body temperature and the risk of heat-related illness.
- **Restricted mobility:** Bulky devices may limit range of motion or agility.
- **User error or mechanical faults:** Unintended movements, malfunctions, or operator mistakes can cause injuries.
- **Muscle deconditioning:** Overreliance on assist devices may weaken natural muscle strength.
- **Cost and suitability:** Exoskeletons vary in price, size, and function — one model may not fit all workers or tasks.

## Staying ahead of evolving standards

Exoskeleton safety research continues to expand. The American Society for Testing and Materials ([ASTM F48](#)) sets the current voluntary standards for design and testing. [The National Aeronautics and Space Administration](#), [American Society of Mechanical Engineers](#), and [OSHA](#) collaborate to create future guidance for robotic-assisted work. Employers should review updates regularly and adjust safety policies as new standards emerge.

## Need help?

OSHA does not have specific standards for exoskeletons, but its existing safety requirements still apply. Follow OSHA's rules for [control of hazardous energy \(lockout/tagout\)](#) and [machine guarding](#), as well as general safety provisions for [electrical](#), [ergonomic](#), and [mechanical hazards](#) to prevent injuries and ensure safe use of powered devices.

For free, on-site consultations to help your workplace comply with OSHA regulations, contact a [DWC Occupational Safety and Health Consultant](#) at **800-242-7031, option 2** or email [HealthSafety@tdi.texas.gov](mailto:HealthSafety@tdi.texas.gov).



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