Technology Spotlight
EXTENDED REALITY

TECHNOLOGY SUMMARY

Extended reality (XR) refers to immersive technologies like virtual reality (VR) and augmented reality (AR). XR allows users to engage with simulated environments (VR) or enhance real-world settings by overlaying graphics, video, or sound (AR). Some XR systems also incorporate haptic feedback, which allow users to physically "feel" these interactions. Adoption may be limited by high upfront cost and resource investments, as well as the potential for discomfort or distraction from headsets or AR overlays. Prioritizing the use of extended reality for high-risk tasks, opting for off-the-shelf, pre-build modules, and engaging with employees early and often can help reduce initial investment risk and guide the use of the technology to deliver the most impact.

VR can immerse workers in high-risk scenarios to practice safe work behaviors in controlled settings.

AR wearables offer on-demand, hands-free training, offering access to microlearning, manuals, etc.
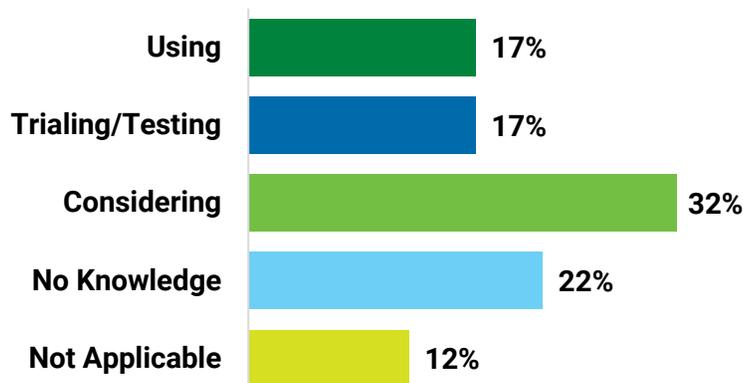
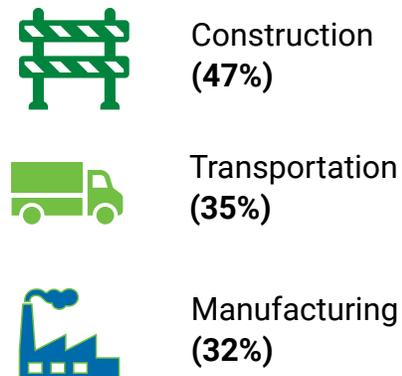*AR can overlay instructions or schematics over equipment or specific areas of the worksite.*

SAFETY TECHNOLOGY 2024 SURVEY RESULTS

According to an **NSC survey** of 500 employers and 1,000 employees in safety-sensitive industries, 17% of employers reported currently using extended reality in the workplace, while 49% said they are either testing or considering its use. The highest reported use of the technology came from employees in construction, transportation and warehousing, and manufacturing.

Use of Extended Reality in the Workplace:

Category	Percentage
Using	17%
Trialing/Testing	17%
Considering	32%
No Knowledge	22%
Not Applicable	12%

Top Industries Testing or Using:

Construction **(47%)**

Transportation **(35%)**

Manufacturing **(32%)**

Voices from the Workplace:

✓ "Virtual and augmented reality training [offers] safer and more engaging simulations without real-world hazards. [It is also] more cost-effective to replicate scenarios."—*Employer (Agriculture)*

⚠ "Employees may need time to learn how to use new technology effectively, leading to temporary drops in productivity during the transition period."—*Employer (Agriculture)*

✓ "[Virtual and augmented reality] can help new hires experience on-the-job training without being physically on site."—*Employee (Construction)*

⚠ "[Virtual and augmented reality] is not the same as hands-on training. [Employees] would still need live practice.—*Employee (Manufacturing)*

Benefits of Extended Reality

- VR training is often more effective than traditional training methods in maintaining learner attention and concentration *(Sacks, Perlman, & Barak, 2013)*.
- VR safety training actively engages learners, often leading to improved learning outcomes *(Kanade & Duffy, 2022)*
- VR training allows workers to identify hazards and practice safe work behaviors in controlled, repeatable settings without exposure to actual risks.
- Use of AR can reduce mental and physical fatigue by overlaying instructions, schematics, or safety information over equipment or in specific areas.

Considerations for Adoption

- High upfront costs are a barrier to adoption. Assess the return-on-investment and consider pilot programs before full-scale deployment.

- AR/VR headsets can cause discomfort, fatigue, or motion sickness for some users. Evaluate for fit, comfort, and usability before deployment, or consider tablet or desktop-based training.

- AR overlays can limit visibility or distract frontline workers. Work with your prospective vendor and end users to ensure content is task-specific and minimally disruptive.

BEST PRACTICES

- **Prioritize extended reality for high-risk tasks or roles where it can deliver the most impact,** helping to maximize value while keeping upfront costs manageable.

- VR training modules can be customized for organization-specific needs. However, to reduce investment costs and simplify implementation, **off-the-shelf and pre-built modules are available for more general safety training** (*e.g., work at height, lockout/tagout, or worksite awareness*).

- **Engage with employees early and often.** Their feedback can be useful in evaluating your current training program, piloting and providing input on extended reality solutions, and providing more oversight on areas of the worksite or tasks employees deem high risk.

For more information, see *Virtual Reality and Augmented Reality for Hazardous Work Training.* For additional resources and guidance on adopting safety technologies, explore the *Work to Zero Safety Innovation Journey*.

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Learn More:
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