Summary
Safety controls for the use of mobile plant, vehicles, and machinery: A review of emerging technologies

Background

Preventing harm from mobile plant, vehicles and fixed machinery is one of SafeWork NSW's 2025-26 Annual Regulatory Priorities.

SafeWork NSW has completed a literature review to identify and synthesise evidence related to new and emerging safety technologies across three focus areas:

- Keeping people and plant separate
- Preventing access to moving parts of machinery
- Promoting safe worker behaviour, including use of personal protective equipment (PPE)

Barriers and facilitators to the adoption of new safety technologies by persons conducting a business or undertaking (PCBUs) and workers were also identified.

The following summary sets out the key information identified in the literature review for general information purposes only. It does not represent a comprehensive statement of all technologies that may be available or create legal obligations under work health and safety laws. SafeWork NSW does not represent that any technologies described have been tested for use and/or are recommended or endorsed by SafeWork NSW.

Technologies for keeping people and plant separate

1. Minimising access to dangerous areas

Geofencing: Vision-based (e.g., artificial intelligence cameras) and location-based technologies (e.g., Bluetooth low energy, ultra-wide band, radio frequency identification devices) can be used to configure a virtual perimeter around a dangerous area. When triggered, alert systems such as alarms or automated messages then notify when someone has entered the dangerous area.

Augmented reality: Workers receive warnings in their direct field of vision when wearing a virtual reality headset if they enter a pre-defined dangerous area. The approach can supplement physical safety signs on worksites.

2. Collision avoidance systems for forklifts and pedestrians

Collision sensors: Sensors are fitted to forklifts and workers so that when two sensors are detected within a pre-defined distance, alerts such as lights and sounds are activated to warn of potential collisions. Some forklifts are being developed with built-in automation to slow or stop the forklift in areas of high traffic.

Vision-based technologies: Cameras with artificial intelligence can be used to monitor forklift movements and provide alerts when detecting a risk of collision.

Augmented reality: Overcomes limitations related to blocked line of sight for forklift operators. A multi-camera system records the forklift's surroundings and displays images to augment the operator's view.

Technologies for preventing access to moving parts of machinery

Sensors: Building on existing presence-sensing systems, additional sensors can sense an individual's proximity to moving parts of machinery. Wearable sensors (e.g., wristbands) can be used to trigger an automatic stop when detected near dangerous moving parts.

Vision-based technologies: As for geofencing, cameras can be used to prevent access to moving parts of machinery. Intelligent video monitoring software can confirm the correct use of physical machine guards and notify when a guard is removed or bypassed.

Technologies for detecting correct use of personal protective equipment

Vision-based technologies: Artificial intelligence systems can be trained to recognise objects and detect correct use of personal protective equipment (PPE) such as safety helmets, safety vests, gloves, and glasses. These systems can also be connected to outputs, such as alarms or door locks.

Considerations for encouraging technology adoption

Adoption and acceptance of new technologies within safety systems are influenced by: the complexity of the technology, cost, personal and organisational capability, the external environment, and data and privacy concerns.

The literature reviewed suggests that PCBUs could:

- Prioritise adoption based on the highest risk areas and organisational climate
- Involve workers in the adoption of technology
- Provide comprehensive training and resources
- Ensure data security and privacy

The reviewed literature also highlights that every technology has limitations and over-reliance on technology can lead to errors, poor decision-making, and workplace harms. To minimise these risks, the reviewed literature proposes that PCBUs could:

- Ensure that new safety technologies are *integrated* into existing safety systems, rather than used as a replacement.
- Assess the work health and safety risks associated with the implementation and use of new technologies in their workplaces.

More information

For more information, please visit the SafeWork NSW website: www.safework.nsw.gov.au

Specific resources related to plant, machinery and equipment: https://www.safework.nsw.gov.au/hazards-a-z/machinery-and-equipment