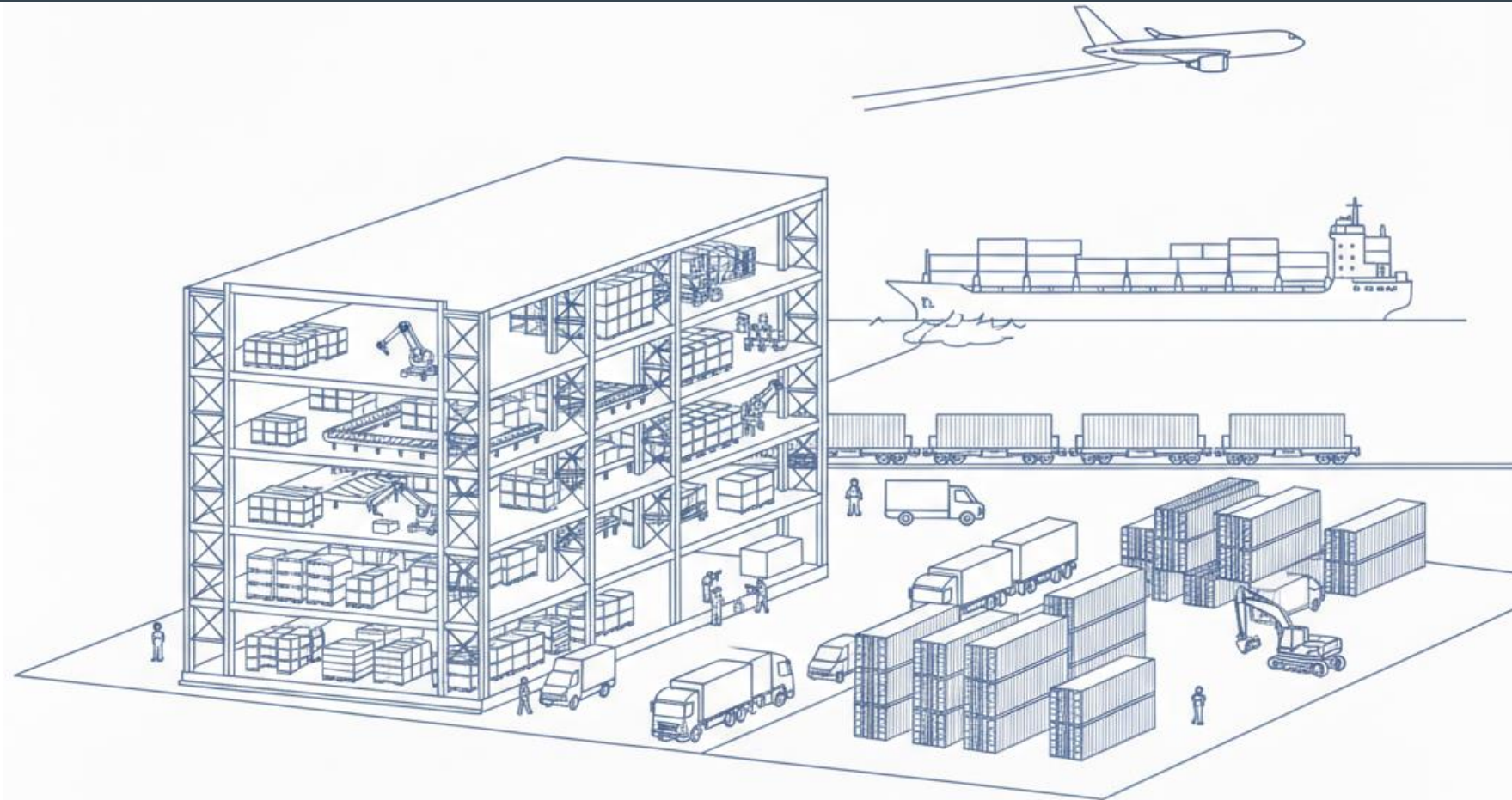


# Workplace Safety and Health Technology in **TRANSPORTATION & STORAGE SECTOR**



**Compiled By:** Ministry of Manpower,  
Workplace Safety and Health Institute (WSHI)

## TRANSPORTATION & STORAGE SECTOR

### EXOSKELETONS



- Provide support for manual handling
- Reduce fatigue and prevent work-related musculoskeletal disorders (WRMSD)

### DRONES



- Access hard-to-reach places for inventory management

### VEHICULAR SAFETY TECHNOLOGY



- Access control system
- Fleet safety management system
- Lorry crane stability control system
- Entrapment prevention sensors
- Proximity sensors

### ROBOTIC SOLUTIONS



- Material transportation robots
- Autonomous warehousing truck/forklift
- Automated storage and retrieval system

### WSH MANAGEMENT APPS



- Electronic permit-to-work system
- Incident and observation reporting system
- Inspection and audit documentation
- Equipment tracking system

### VIDEO ANALYTICS



- Detect and alert non-compliance to safety protocols
- Detect and alert workplace hazards
- Geofencing

### VIRTUAL REALITY TRAINING



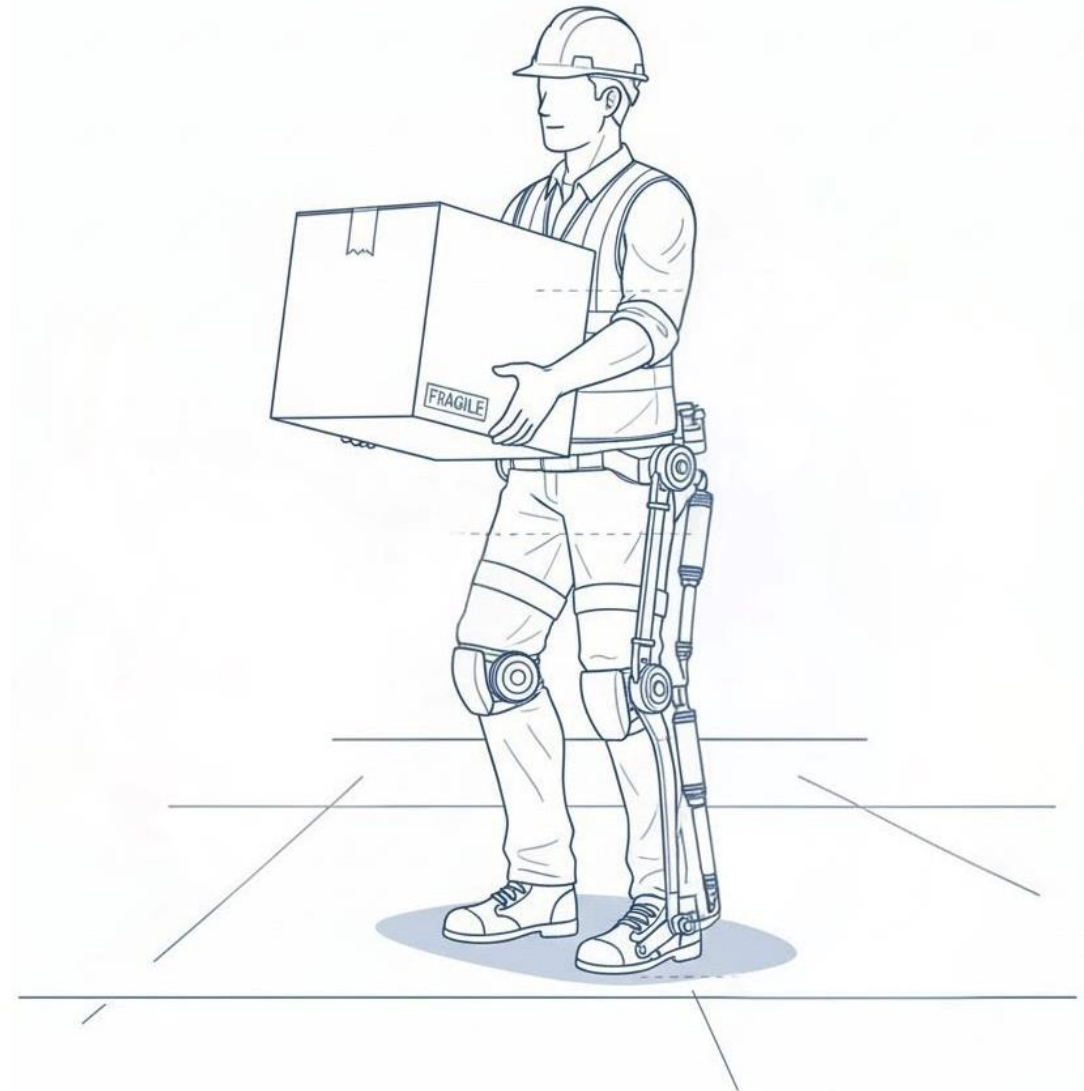
- Work-at-height safety awareness and training
- MEWP training and simulation

## EXOSKELETONS

Exoskeletons can augment strength and provide support for workers during manual handling. Some common applications include overhead work, lifting and carrying objects.

### BENEFITS

- Reduce strain and fatigue
- Lowers risk of WRMSD
- Decreases likelihood of accidents caused by fatigue or loss of concentration
- Maintains work efficiency over longer periods
- Physically demanding jobs are more accessible to a diverse workforce



## DRONES FOR INVENTORY MANAGEMENT



Drones can reduce worker exposure to high-risk activities such as working at height.

Common use cases in transport and storage include:

- Inventory counting in high-bay warehouses
- Inspection of hard-to-reach storage areas

### BENEFITS

- Remove workers from high-risk environment
- Less time taken for inspections
- Less manpower required for the job
- Workers can be trained as drone operators for career development





## VEHICULAR SAFETY TECHNOLOGIES

Vehicular safety technology can enhance driver/operator awareness during operation and provide timely alerts to prevent collisions. Some examples include:

### LORRY CRANE STABILITY CONTROL SYSTEM

A proven technology that can prevent overloading and toppling of lorry cranes by limiting its lifting capacity if the outriggers are not fully extended



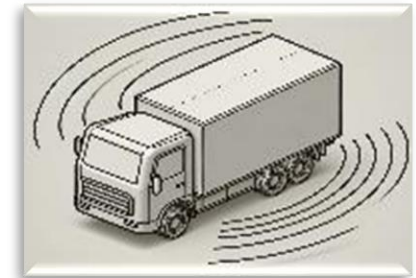
### FLEET SAFETY MANAGEMENT SYSTEM

Telematics tracks driver behaviour to promote safer driving habits. 360-degree cameras eliminate blind spots and driver safety monitoring system detects driver fatigue and distraction.



### PROXIMITY SENSORS

A solution to alert driver/operator when closing in on humans or obstacles to avoid collision.



### EXPLORE GRANT SUPPORT SCHEMES



Lorry Crane Stability Control System (SCS) Grant

### EXPLORE GRANT SUPPORT SCHEMES



Productivity Solutions Grant: Fleet Safety Management System



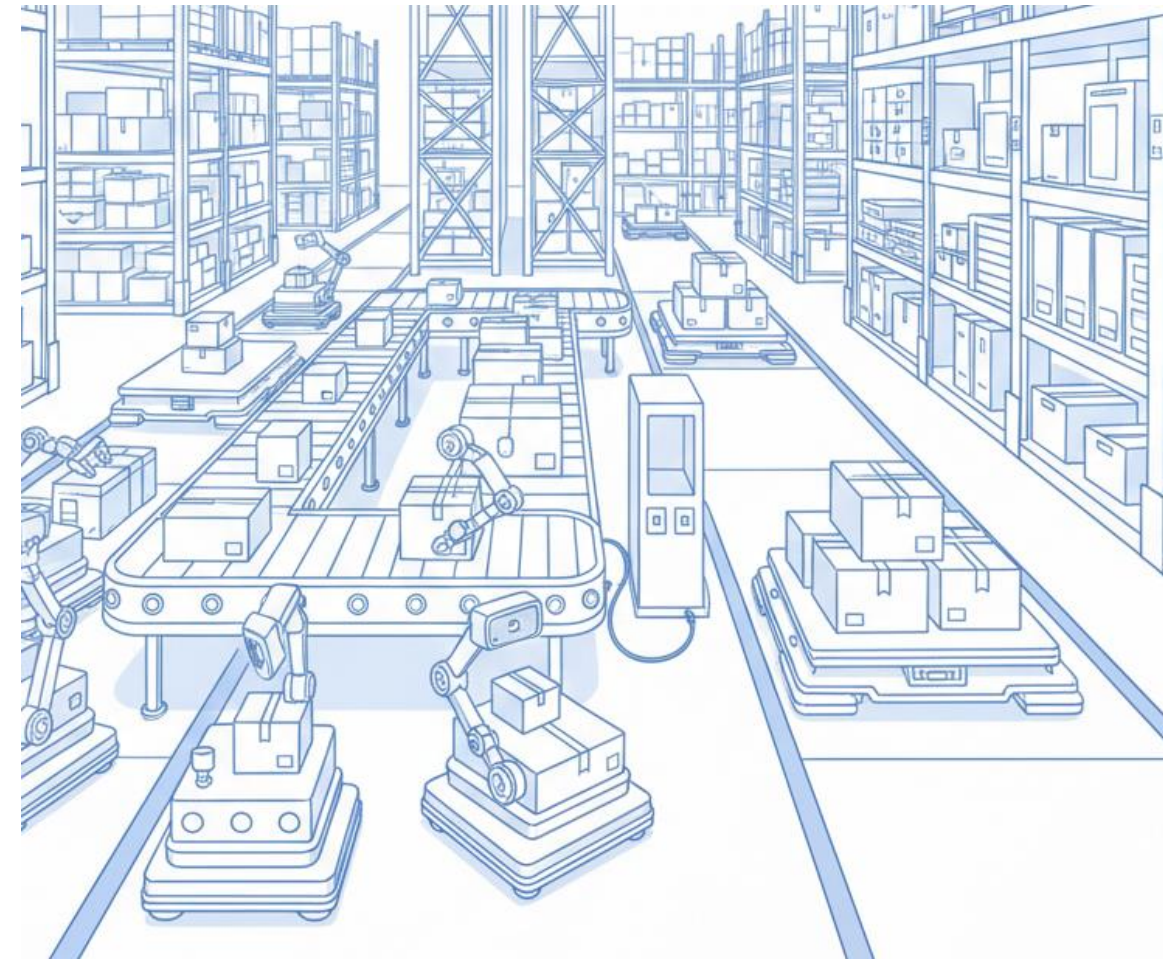
## ROBOTIC SOLUTIONS

Robots can automate certain tasks and free workers to take on more complex jobs.

- Materials transportation
- Goods sorting
- Retrieve goods at height

### BENEFITS

- Remove workers from high-risk work activities, such as working at height
- Reduce risks of WRMSD
- Less manpower required for the job
- Multiple robots can be controlled by one operator, enhancing productivity
- Workers can be trained as robot operators for career development





## WSH MANAGEMENT APPLICATION / SOFTWARE

WSH management apps enable tracking of safety-related processes and issues, keeping stakeholders informed of necessary actions. Common features of such app include:

### ELECTRONIC PERMIT-TO-WORK SYSTEM

- Prevents falsification and backdating of permits
- Identifies conflicting work and overdue permits
- Full visibility of all ongoing high-risk activities
- Enhanced productivity by reducing paperwork

### INCIDENT AND OBSERVATION REPORTING SYSTEM

- Platform to report safety incidents and observations
- Corrective and preventive actions are tracked until closure

### EQUIPMENT TRACKING SYSTEM

Keep track of statutory equipment on-site and perform mandatory inspections on time

### INSPECTION AND AUDIT DOCUMENTATION

- Document inspection and audit findings
- Track action items until completion





# Workplace Safety and Health Technology in Transportation & Storage

## VIDEO ANALYTICS

Video analytics solutions can leverage existing video surveillance systems to detect unsafe acts and conditions, providing real-time alerts for prompt issue rectification. Common use cases include:

### PPE DETECTION



### SMOKE AND FIRE DETECTION



### SLIPS, TRIP & FALLS DETECTION



### GEOFENCING



### POOR HOUSEKEEPING



### POOR LIFTING POSTURE



### WORKER NEAR VEHICLE/MACHINERY



### UNSAFE ACTS ON FORKLIFT





## VIRTUAL REALITY (VR) TRAINING

Workers can experience job hazards virtually and learn to perform tasks safely through interactive methods, enhancing knowledge retention.

Examples of training courses include:

- Safety Awareness
- Emergency Response
- Operate Mobile Elevating Work Platform
- Operate Forklift
- Working at Height



# Funding Support for WSH Tech Adoption

Grant Scheme	About	Support level	Examples of WSH Tech that may be supported	Link
<b>Productivity Solutions Grant (PSG)</b>	Supports businesses in the adoption of pre-scoped IT Solutions and/or Equipment that improve productivity.	Up to 50% of qualifying cost, capped at \$30,000 per small and medium enterprise (SME)	Electronic permit-to-work, vehicular safety tech, video analytics	<a href="#">PSG</a>
<b>NTUC Company Training Committee (CTC) Grant</b>	Helps organisations implement transformation plans to enhance business capabilities and worker outcomes.	Up to 70% of qualifying project cost	Robotics & automation solutions, WSH management apps, vehicular safety tech, video analytics, VR training	<a href="#">CTC</a>
<b>Enterprise Development Grant (EDG)</b>	Supports projects that help companies upgrade, innovate, grow and transform their businesses.	Up to 50% of qualifying costs for local SMEs and up to 30% of qualifying cost for non-SMEs	Robotics & automation solutions, drones	<a href="#">EDG</a>

# Innovation Challenges for Development of WSH Tech

Innovation challenge	About	Benefits	Link
<b>Open Innovation Platform (OIP)</b>	A crowd-sourcing platform that connects and matches real business challenges or digitalisation opportunities of Problem Owners to Problem Solvers.	Problem Owners can gain access to a large community of Solvers with multi-disciplinary expertise and can crowdsource for innovative ideas to support their digitalisation needs. Problem Solvers can win prize monies, and co-innovate with Problem Owners to develop, validate and test their solutions.	<a href="#">OIP</a>