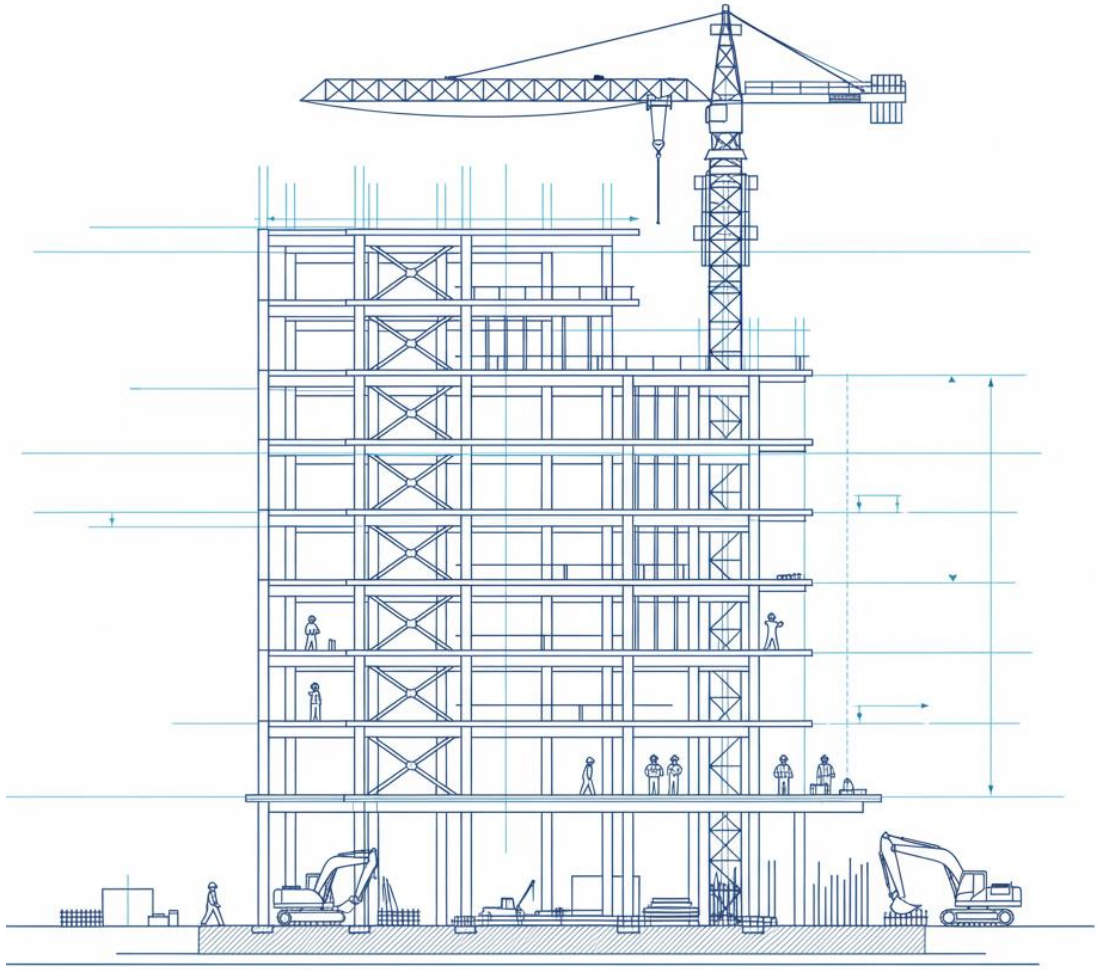
Workplace Safety and Health Technology in CONSTRUCTION SECTOR



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

Ministry of Manpower

Workplace Safety and Health Technology in

CONSTRUCTION SECTOR

360º CAMERA FOR SMART INSPECTION

- Track project progress
- Facilitate communication and identification of worksite hazards

DRONES

- Façade inspection
- Confined space inspection
- Construction progress monitoring

HEAT STRESS SOLUTIONS

- Real-time wet bulb globe temperature (WBGT) monitoring system
- Ice slurry
- Cooling vests and garments

ROBOTIC SOLUTIONS

- Material transportation robots
- Wall finishing robots
- Drilling robots
- Façade cleaning and painting robots

VEHICULAR SAFETY TECHNOLOGY

- Lorry crane stability control system (SCS)
- Fleet safety management system
- Proximity sensors

VIDEO ANALYTICS

- Detect and alert non-compliance to safety protocols
- Detect and alert worksite hazards such as open sides, areas under lifted load
- Geofencing

VIRTUAL REALITY TRAINING

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

WSH MANAGEMENT APPS

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

**Non-Exhaustive list of WSH Technology Solutions*

360º CAMERA FOR SMART INSPECTION AND PROGRESS MONITORING

360° cameras for smart inspection enhances progress monitoring and improves inspection efficiency.

Supervisors wear 360° cameras on helmets during inspections. AI is used to map site location to a digital map. After the initial inspection, supervisors can virtually revisit site conditions and identify hazards overlooked during the initial walkthrough.

BENEFITS

- Improve inspection by facilitating hazard detection
- Reduce effort to track site progress
- Fewer disputes over discrepancies between planned and actual construction
- Supervisors can upskill and be trained to conduct more efficient inspections.

DRONES FOR INSPECTION AND MONITORING

Drones can reduce exposure to high-risk activities such as working at height and in confined spaces.

Common use cases in construction include:

- Building façade inspection and progress monitoring
- Confined space inspection

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

EXPLORE GRANT SUPPORT SCHEMES

Productivity Solutions Grant: Integrated and Smart Worksite Monitoring and Inspection

HEAT STRESS SOLUTIONS

Solutions that can help to monitor heat stress or lower the risk of heat-related illnesses.

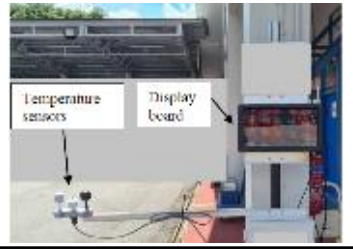
BENEFITS

- Monitor heat stress and trigger alerts for prompt interventions
- Cool down workers, lowering risk of heat injuries
- Reduce heat fatigue and improve concentration, lowering risk of heat-induced accidents and increasing productivity

COOLING VESTS AND GARMENTS

ICE SLURRY

Real-time WBGT monitoring system



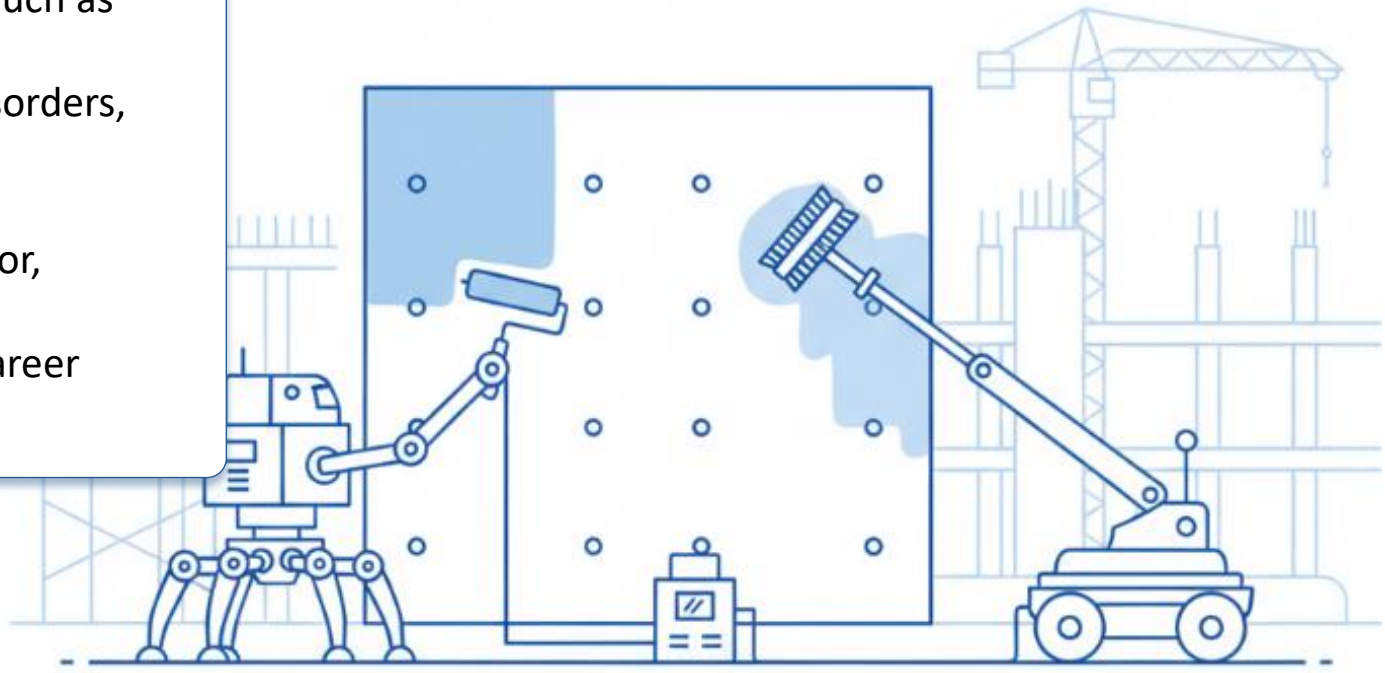
ROBOTIC SOLUTIONS

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

- Building façade painting and cleaning
- Rebar tying
- Painting and wall finishing
- Materials transportation

BENEFITS

- Remove workers from high-risk work activities, such as working at height
- Reduce risks of work-related musculoskeletal disorders, exposure to dust and chemicals
- 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



VEHICULAR SAFETY TECHNOLOGIES

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

LORRY CRANE STABILITY CONTROL SYSTEM

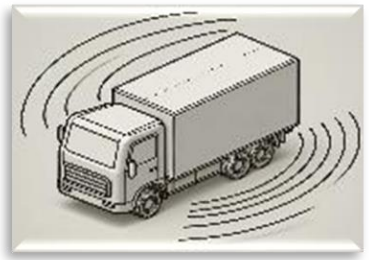
A proven technology that can prevent overloading and toppling of lorry cranes by limiting its lifting capacity if the outriggers are not fully extended

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

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

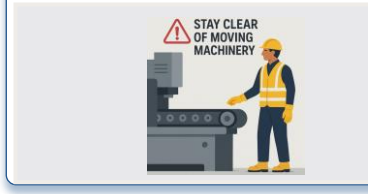
WORKER UNDER LIFTED LOAD

WORKER NEAR OPEN SIDES

GEOFENCING

POOR HOUSEKEEPING

WORKER NEAR VEHICLE/MACHINERY



EXPLORE GRANT SUPPORT SCHEMES

Productivity Solutions Grant: Integrated and Smart Worksite Monitoring and Inspection

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
- Lock Out Tag Out
- Operate Mobile Elevating Work Platform
- Confined Space Entry
- Lifting Operations
- Working at Height

Workplace Safety and Health Technology in Construction

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

EXPLORE GRANT SUPPORT SCHEMES

Productivity Solutions Grant: Integrated and Smart Worksite Monitoring and Inspection

Productivity Solutions Grant: e-PTW

Funding Support for WSH Tech Adoption

Grant Scheme	About	Support level	Examples of WSH Tech that may be supported	Link
Productivity Solutions Grant (PSG)	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	PSG
NTUC Company Training Committee (CTC) Grant	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	CTC
Enterprise Development Grant (EDG)	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	EDG
Built Environment Technology and Capability (BETC) Grant	Supports BE firms to develop new capabilities in enterprise, technology and manpower and strive for longer-term and more holistic transformation.	Up to 70% of qualifying costs for local SMEs and up to 50% of qualifying cost for non-SMEs	Robotics & automation solutions, drones, video analytics, WSH management apps, smart inspection solutions	BETC

Innovation Challenges for Development of WSH Tech

Innovation challenge	About	Benefits	Link
Open Innovation Platform (OIP)	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.	OIP
Built Environment Accelerate to Market Programme (BEAMP)	Aims to bring inventors and companies together to fast-track the innovation process to solve real world industry challenges.	Companies can launch problem statement on BEAMP platform and gain greater exposure. Funding for solution developers supports up to 70% of qualifying costs, capped at S$30,000 for the Accelerate Solution Development (ASD) phase and S$250,000 for the Market Development (MD) phase.	BEAMP