



Workplace Safety, Health and Environmental Good Practices Handbook

Foreword

Land Transport Authority (LTA) places great emphasis on the importance of safety, as well as minimizing the impacts caused to the environment arising from our construction activities.

This Handbook is a compilation of exemplary safety and environmental site practices implemented by LTA's contractors who have gone the extra mile to achieve safety and environmental excellence.

The good practices comprise of innovative solutions to challenges faced on most sites, as well as improved work procedures that enhance safety and environmental performance. While every site is unique, there are common issues that may be faced by most contractors. Hence, these good practices are shared with all to encourage continual learning and improvement.

Contractors are recommended to adopt good practices that may be applicable to their worksites, but should also exercise discretion in adopting the practices according to the needs of their sites.

Disclaimer

All illustrations shared in this Handbook are meant for learning purposes only. The learning points for each illustration are not exhaustive and should not be taken to encapsulate all the responsibilities and obligations of the user of this Handbook under the law. LTA and its authorized agents do not accept any liability or responsibility to any party for any losses or damage arising from following this Handbook.

Compliance with this Handbook does not of itself confer immunity from legal obligations.

As a guide, this Handbook has no legal standing.

All rights reserved. This publication is not for commercial purposes. It is intended for the use of the Land Transport Authority's officers and its contractors. No part of this publication may be reproduced or transmitted in any forms or by any means, in parts or whole, without the prior written permission of the Land Transport Authority.

Copyright © September 2017
Land Transport Authority, Singapore

Published by Land Transport Authority

Enquiries can be directed to LTA Safety Division

Acknowledgement

LTA would like to acknowledge the following contractors for their contributions (in no order of merit) in the making of this Good Practices Handbook.

- China Jingye Construction Engineering Singapore Pte Ltd
- China State Construction Engineering Corporation Ltd
- Chin Yuan Metal Pte Ltd
- Daewoo Engineering & Construction Co., Ltd
- Doka Formwork Pte Ltd
- Gammon Construction Limited Singapore Branch
- GS Engineering & Construction Pte Ltd
- Nishimatsu Construction Co. Ltd
- Nishimatsu Construction Co., Ltd - Bachy Soletanche Singapore Pte Ltd Joint Venture
- Penta-Ocean Construction Co Ltd - Bachy Soletanche Singapore Pte Ltd Joint Venture
- Quek & Quek Civil Engineering Pte Ltd
- Samsung C & T Corporation
- Shanghai Tunnel Engineering Co. (S)
- Singapore Technologies Electronics Limited
- Ssangyong - Hyundai Joint Venture
- Woh Hup (Private) Ltd
- Woh Hup - Shanghai Tunnel Engineering Joint Venture

Contents

Safety

| | |
|--|----|
| <u>Application of Technology</u> | 6 |
| <u>Competency</u> | 13 |
| <u>Construction Methods</u> | 17 |
| <u>Engagement</u> | 20 |
| <u>Innovation</u> | 23 |
| <u>Material Storage</u> | 27 |
| <u>Welfare</u> | 30 |

Environmental

| | |
|--|----|
| <u>Air Pollution Control</u> | 34 |
| <u>Noise Control</u> | 36 |
| <u>Vector Control</u> | 40 |
| <u>Waste Management</u> | 42 |

Application of Technology



Application of Technology



Reflective Safety Vest with LED Lights

Provide traffic controller with reflective safety vest fitted with LED lights

- Increases visibility of traffic controller
- Enhances safety of motorists and traffic controller

Application of Technology



Robotic Traffic Marshal

Deploy robotic traffic marshal to guide traffic

- Eliminates risk of traffic accidents
- Ensures that a traffic controller is available at all times of the day to alert motorists of the temporary road works ahead

Application of Technology



Aqua Cutter

Employ the use of aqua cutter for rebar exposure

- Increases work efficiency for rebar exposure process
- Eliminates hazards associated with conventional methods such as excavator hacker machine

Application of Technology

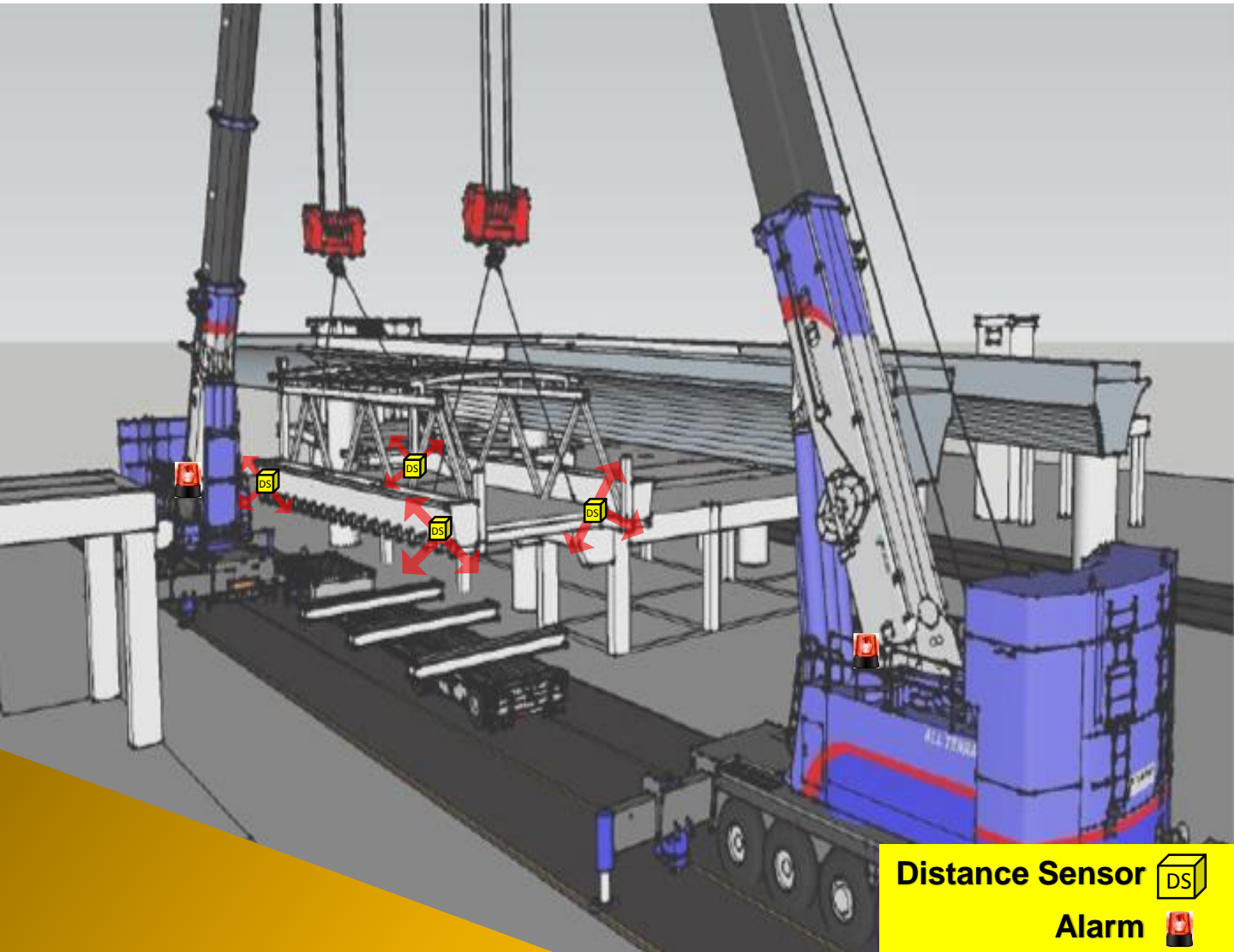


Virtual Training

Incorporate virtual reality (VR) technology for workers' training

- Allows workers to have a more realistic safety training experience
- Enhances workers' learning and understanding of safe work processes

Application of Technology



Wireless Anti-Collision Sensory Protection Device

Install sensor and alarm system before lifting operation commences

- Reduces risk of collision with nearby structures
- Enhances safety of lifting operations

Application of Technology



Portable Lightning Detector

Provide portable lightning detector for workers

- Provides pre-lightning warnings
- Improves safety on site

Competency



Competency



Safety Training School

Set up a safety training school to train workers on workplace safety and health

- Enhances workers' learning experiences

Competency



Buddy System

Assign one experienced worker to guide each new worker on site

- Helps new workers to better adapt to work practices on site

Competency



Personnel Competency Stickers

Provide stickers to identify competent users

- Allows for quick identification of workers' competency
- Reduces occurrences of unsafe usage of tools and equipment by untrained workers

Construction Methods



Construction Methods



System Formwork

Employ the use of system formwork for casting of large structures

- Improves structural integrity of temporary works
- Avoids potential hazards arising from using incompatible materials from different systems

Construction Methods



Modular Scaffold Access

Provide modular scaffolds for safe access to deep excavations

- Eliminates risk of falling from height
- Eliminates risk of falling objects

Engagement



Engagement



Stakeholders Engagement

Carry out regular stakeholders engagements and assist to address their concerns

- Helps to build a good relationship with stakeholders

Engagement



Care for Community Spaces

Carry out housekeeping and oiling at areas outside site boundaries

- Helps to build a good relationship with stakeholders

Innovation





LED Lights

Provide Light-Emitting Diode (LED) lights to highlight safe access and egress in work areas

- Illuminates access and egress under low light conditions



Delineated Wire Mesh Access

Provide proper and durable wire mesh overlay across rebar surface

- Eliminates risk of workers tripping on rebar gaps



Mobile Ladder Platform

Provide mobile ladder platform to access rebar works

- Provides a proper safe platform to access work area
- Reduces risk of falling from height

Material Storage



Material Storage



Racks for Rebar Storage

Provide racks at material storage areas to hold rebar in place

- Provides proper access for workers to retrieve materials
- Reduces risk of tripping

Material Storage



Material Storage Racks

Provide racks and containers for storage of loose materials

- Prevents tripping
- Improves general housekeeping

Welfare





Health Checks

Conduct regular health checks for all workers

- Ensures that workers are in good health before work starts

Welfare



Double Storey Rest Area

Install double storey workers' rest area

- Occupies less space on site
- Houses more workers

Environmental

Air Pollution Control



Sprinkler System

Install automatic water sprinkler systems to wet vehicular access

- Reduces dust on site

Air Pollution Control



Vacuum Machine with Water Sprayer

Provide a vacuum machine with water sprayer to wet vehicular access

- Reduces dust on site

Noise Control



Ventilation Fan Silencer

Install silencer at the end of ventilation fan

- Reduces noise emission from ventilation fan

Noise Control



Noise Enclosure for Ventilation Fan

Provide noise enclosure for ventilation fan

- Reduces noise emission from ventilation fan



Retractable Noise Enclosure

Install retractable noise enclosure over the opening of launch shaft

- Reduces noise emission from tunneling activities
- Allows for multiple launches of TBM and ease of moving materials

Noise Control



Jagged Edge Noise Barrier

Provide innovative noise barriers with enhanced performance

- Reduces noise emission from site

Vector Control



Mosquito Magnet

Provide mosquito magnet at workers' rest areas to supplement vector control efforts

- Eliminates adult mosquitoes from site

Vector Control

BEFORE



AFTER



End Cap for Bolt Socket

Install end cap for bolt socket of tunnel segment rings

- Prevents water ponding in bolt sockets
- Eliminates potential mosquito breeding

Waste Management



Upcycling

Upcycle waste materials for other uses e.g. reuse wooden crates to create furniture

- Reduces amount of waste generated
- Encourages workers to be environmentally friendly

Waste Management



Food Waste Composter

Recycle food waste (e.g. fruits and vegetables) into fertilizer

- Reduces amount of food waste generated from site (i.e. canteen)