Land Transport Authority

We Keep Your World Moving

CONSTRUCTION SAFETY HANDBOOK

zero ACCIDENT

Published by Land Transport Authority
Enquires can be directed to LTA Construction Safety & Environmental Protection Division

Land Transport Authority

SAFETY AND HEALTH POLICY STATEMENT

The Land Transport Authority's mission is connecting people and places and enhancing travel experience. In discharging our responsibilities, we accord paramount importance to safety and health.

OUR GOAL

We strive for the highest standards of safety and health consistent with international best practices. We strongly believe that every accident is avoidable. We aim to achieve zero incidents for all our projects and zero health impact to our workforce.

OUR COMMITMENTS

We pledge to:

- Place top priority on the safety of all users of road, rail and public transport systems;
- Make safety and health a primary objective in the planning, design, construction, operation, maintenance and regulation of land transport infrastructure and systems; and
- Continually achieve improvement in the overall safety and health performance of our projects towards zero incidents and zero health impact to our workforce.

OUR STRATEGIES

We pursue excellence in safety through:

- Implementing a structured Project Safety Review (PSR) system in the planning, design, development and management of land transport infrastructure and systems;
- Complying with statutory requirements and implementing an occupational safety and health (OSH) management system in the construction of land transport infrastructure and systems;
- Nurturing a corporate culture that promotes safety and health;
- Collaborating with our contractors and relevant institutions to enhance safety and health.

OUR ROLES

"Safety and Health for All" must be embraced by everyone. All staff who have direct control of activities that affect safety and health are to demonstrate them explicitly in their execution of these activities.

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PREFACE

The Land Transport Authority published its first Construction Safety Handbook in October 2002.

This is the third edition August 2019.

INTRODUCTION

The Workplace Safety and Health (WSH) Act and its subsidiaries regulations was gazetted in 1 Mar 2006. It is based on the 3 principles of WSH Management.

They are:

a) Reducing risk at the source by requiring all stakeholders to remove or minimise the risk they created.
b) Encourage industries to adopt greater ownership of safety and health outcomes.
c) Impose higher penalties for poor safety management and outcomes.

INTRODUCTION

Some of the subsidiary regulations of WSH Act which are applicable to the construction industry are as follows :

- WSH (General Provisions) Regulations
- WSH (Construction) Regulations
- WSH (Incident Reporting) Regulations
- WSH (First Aid) (Amendment) Regulations
- WSH (Medical Examinations) Regulations
- WSH (Risk Management) Regulations
- WSH (Explosives Powered Tools) Regulations
- WSH (Confined Spaces) Regulations
- WSH (Operations of Cranes) Regulations
- WSH (Scaffold) Regulations
- WSH (Work at Heights) Regulations
- WSH (Design for Safety) Regulations

This revised Construction Safety Handbook aims to provide project teams, contractors and consultants a better understanding and emphasis of the updated WSH regulations, LTA's Safety & Health requirements and encourage safe work practices in construction sites.

CONSTRUCTION SAFETY INDICATORS

Accident Frequency Rate (AFR) :

$$\frac{\text{No. of MOM Reportable Accident}}{\text{Manhours Worked}} \times 1{,}000{,}000$$

Accident Severity Rate (ASR) :

$$\frac{\text{No. of Mandays lost due to MOM Reportable Accident}}{\text{Manhours Worked}} \times 1{,}000{,}000$$


TOTAL
WSH
TOTAL
WSH

Total Workplace Safety & Health:

A healthy workforce is the outcome of a safe workplace. At the same time, a healthy workforce is also a contributor to safety, because healthy and fit workers can concentrate better and work safely.

The work environment, safety and health of workers are closely inter-related. Reducing the risks of injuries and ill-health at the workplace will lead to better well-being for workers and a more productive workforce.

Relationship between Work, Safety and Health

Phase 1 – Assessment

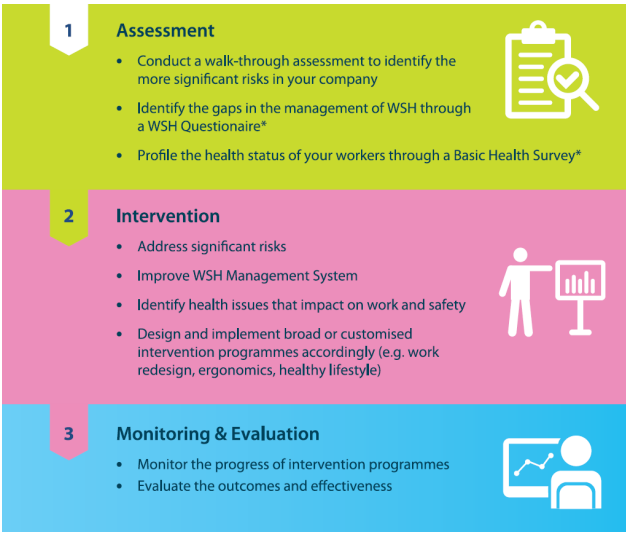
A company Walk-through Assessment (WTA) is carried out by WSH professionals to identify both safety and health risks as well as possible gaps in the current WSH management.

Phase 2 – Intervention

Companies will implement targeted and broad-based interventions based on the priority areas identified earlier. Targeted interventions include health screening and follow-up coaching, which is customized according to the workers' health risks. Safety gaps identified from Phase 1 will be weaved into this coaching as well, making it a holistic intervention. Depending on the profile of the workers, broad-based programmes such as physical activity sessions, talks or workshops on nutrition and safety can also be conducted. Apart from the programmes, risk recommendations are provided to the company so that they can address safety issues.

Phase 3 – Monitoring and Evaluation

Lastly, the effectiveness of these programmes is closely monitored and assessed. Some examples of potential indicators are productivity levels, healthcare costs and returns on investment for the company.



Assessment, Intervention programmes, Monitoring and Evaluation approach

Sources: www.wshc.sg/totalwsh

RISK MANAGEMENT

WSH (Risk Management) Reg :

A 'hazard' means anything with the potential to cause bodily injury, and includes any physical, chemical, biological, mechanical, electrical or ergonomic hazard.

A 'risk' means the likelihood that a hazard will cause a specific bodily injury to any person.

WSH (Risk Management) Reg :

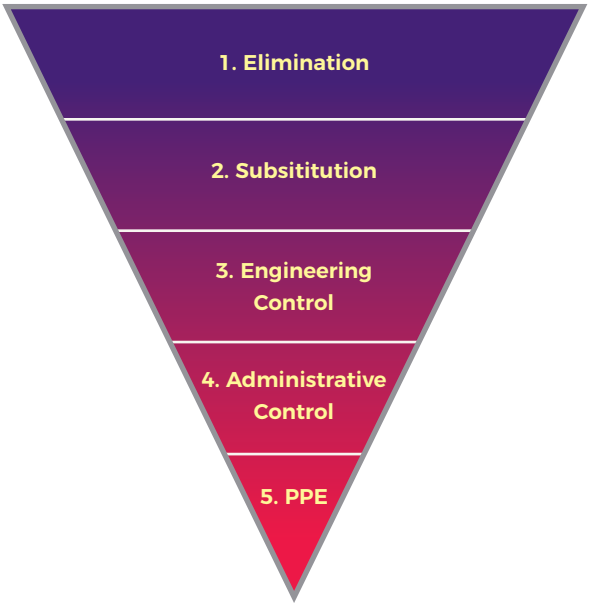
The employer, self-employed person and principal shall take all reasonably practicable steps to eliminate any foreseeable risk to any person who may be affected by his undertaking in the workplace.

Where it is not reasonably practicable to eliminate the risk, the employer, self-employed person or principal shall implement :

a) such reasonably practicable measures to minimise the risk; and

b) such safe work procedures to control the risk.

Hierarchy of Risk Control



- Formulate control measures according to the Hierarchy of Controls
- Analyse and evaluate residual risks

- Evaluate the risk levels of the workplace hazards
- Prioritise the hazards to be controlled

- Identify hazards
- Identify potential accidents or incidents

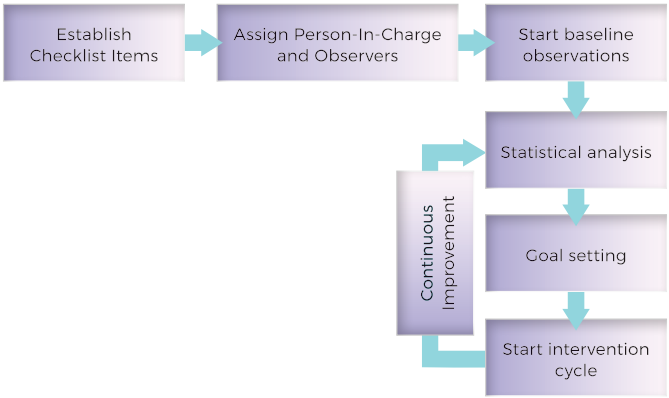
BEHAVIOURAL BASED SAFETY (BBS)

LTA Specification :

The Contractor shall implement a BBS programme based on the training provided by the Engineer. The BBS programme shall be approved by the Engineer before implementation.

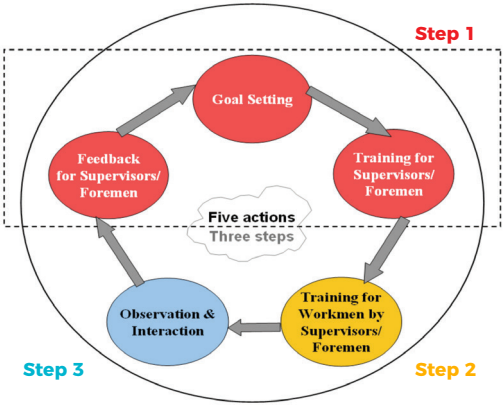
BBS is a proactive safety approach focusing on motivating individuals to work safely and correct fellow workers' at-risk behaviours that may lead to an injury. It's ultimate aim is to condition the target group's way of thinking and reinforcing positive safety beliefs, values and attitude which will then influence their behaviour and building a good safety culture.

BBS starts with baseline observation where workers behaviours were observed without any intervention based on an established checklist of critical behaviours.



BBS Implementation Procedure

Based on the result of baseline observation, a goal-setting committee was formed to set achievable targets for safe behaviour. Improvement for the critical behaviours and monitor intervention results according to the intervention cycle below.



BBS Intervention Cycle

Step 1 :
Observation results and causes of unsafe behaviours communicated to supervisors

Step 2 :
Train the trainers (supervisors) on methods to promote safe behaviour

Step 3 :
Discuss and set new goals for next observation cycle

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NEAR-MISS

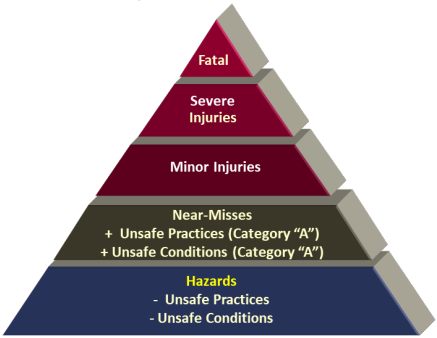
Near Miss Definition:

Within LTA's reporting system, there are two classifications of Near-Misses, mainly the Near-Miss and Near-Miss (Category A)

Near-Miss Definition
An event that could have resulted in loss through personal injury or damage to assets.

Near-Miss (Category A) Definition
Near-Miss (Category A), recognise serious situations which may result in severe injuries/fatality.

An example of Near-Miss (Category A) as below:
1. Unsafe Practices (Example, Working at height next to an opening without a harness)
2. Unsafe Conditions (Example, Unprotected opening not barricaded effectively)



Accident Pyramid

Near-Miss Reporting:

Near-Miss reporting is an important mechanism that organisations should utilise to improve their safety performance. It is also a learning opportunity to close the gaps in the safety management system.

The reporter should not be reprimanded for reporting near-miss.

Money incentives given to encourage workers to report near-miss

Emphasis must be given to the importance of conducting proper investigations on all reported near-miss incidents in order to find out the underlying direct and root causes of occurrences to successfully prevent near-miss recurrence or escalation into an accident.

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DESIGN FOR SAFETY (DfS)

WSH (Design for Safety) Reg :

The regulation is to direct stakeholders such as Developers, Designers and Contractors to work together to address the risk at source and plan for the construction work, so as to identify and eliminate, as far as reasonably practicable, foreseeable risk(s) to the safety or health of any person.

The WSH (DfS) Regulations is applicable to all projects that:

LTA Specification :

The Contractor shall propose and engage a qualified and competent DfS Professional. The qualifications of DfS Professional proposed for this contract shall include:

a) Reasonable exposure in safety and health for construction especially on transportation infrastructure projects in a similar nature to this Contract, and

b) Attended the DfS for Professional Course and passed the assessment, or equivalent, and either

c) Be a registered PE or Architect with a Practicing Certificate or

- Have 10 years relevant experience in the design (at least five (5) years in design which includes contributions to designs, writing specifications) and the supervision of the construction of structures; and
- Have a degree accepted by PEB or BOA and construction related degree accepted by SISV and SPM

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CONFINED SPACE

WSH (Confined Spaces) Reg :

The authorised manager for a confined space may issue a confined space entry permit in respect of entry into or work in the confined space if the authorised manager is satisfied that :

- √ Oxygen level in the confined space is within the range of 19.5% to 23.5% by volume;
- √ Level of flammable gas or vapour in the confined space is less than 10% of its lower explosive limit;
- √ Levels of toxic substances in the atmosphere of the confined space do not exceed the permissible exposure levels*
- √ Confined space is adequately ventilated
- √ Effective steps have been taken to prevent any ingress of dangerous gases, vapours or any other dangerous substances into the confined space
- √ All reasonably practicable measures have been taken to ensure the safety and health of persons who will be entering or working in the confined space.

** Specified in the First Schedule to the Workplace Safety and Health (General Provisions) Regulations*

Permit-To-Work displayed on site

Provision of ventilation fan and duct

WSH (Confined Spaces) Reg :

It shall be the duty of the responsible person of a person entering into or working in a confined space to ensure, before such entry or work, that the person has first received adequate safety and health training for the purpose of familiarising himself with the hazards associated with such entry into or work in the confined space and the precautions to be observed.

Following courses are mandatory for Confined Space works :

- √ *Safety Orientation Course Tunnelling for Workers*
- √ *Perform Work in Confined Space Operation*
- √ *Supervised Work in Confined Space Operation*
- √ *Assess Confined Space for Safe Entry and Work*

WSH (Confined Spaces) Reg :

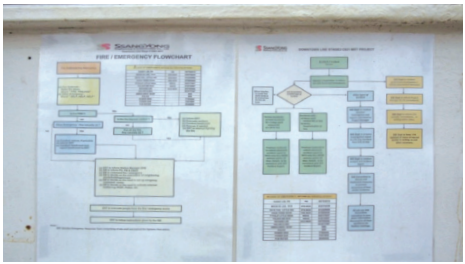
An appointed confined space attendant shall remain outside the confined space in order to :

a) monitor persons entering into and working in the confined space;
b) maintain regular contact with the persons in the confined space and when necessary assist them to evacuate should the need arise; and
c) alert the persons appointed to carry out rescue work in the event of an emergency.

Confined space attendant monitor persons entering and working in the confined space

WSH (Confined Spaces) Reg :

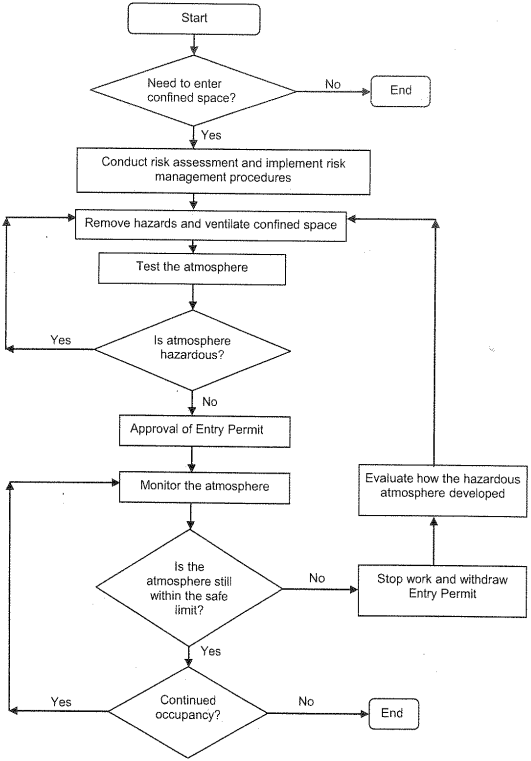
It shall be the duty of the responsible person of a person entering into or working in a confined space to establish a written rescue plan for the purpose of rescuing persons in the confined space in the event of an emergency.



Emergency flowchart prominently displayed on site

Emergency Escape Route signage prominently displayed on site

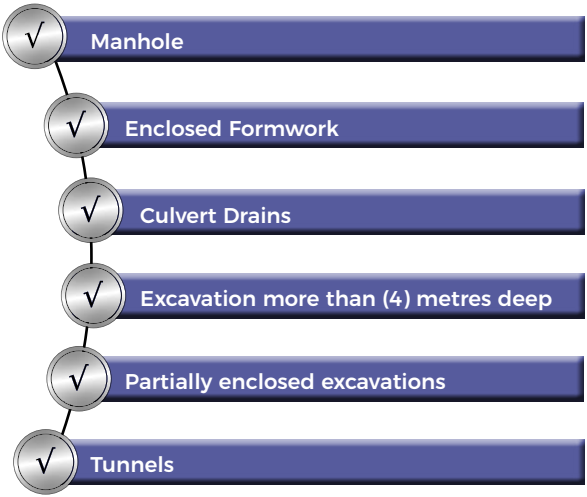
SS 568: 2011 :



Flowchart of procedures for confined space entry

LTA Specification :

In addition to the requirements of the Workplace Safety and Health (Confined Spaces) Regulations and SS 568, Code of Practice for Confined Spaces, the Contractor shall also classify the following as confined spaces:



And shall apply all legislative requirements of confined spaces

LTA Specification :

The Contractor shall have controlled access / egress points to confined spaces to prevent unauthorised access. Where practicable the Contractor shall ensure that there are at least two (2) readily accessible escape routes from each confined space.

The Contractor shall operate a tag system for entry so that all personnel entering the confined space can be accounted for.

Ingress & Egress of Confined Space

RFID system to monitor head counts before entering into confined space

LTA Specification :

Gas monitoring shall be conducted by a competent confined space assessor to certify that the confined space is safe for workers to enter and thereafter at every **four**-hour intervals.

Display of gas check

LTA Specification :

The Contractor shall ensure that there is an certified man-riding cage capable of taking a stretcher and two persons, together with an identified crane equipped with rescue equipment, on standby at all times whilst work is carried out in the confined space.

Where this is not reasonably practicable a stretcher which is capable of being brought manually out of the confined space (deep excavation) should be located at a convenient point.

Example of a man-riding cage which is capable of taking a stretcher

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ELECTRICAL
INSTALLATIONS

WSH (Construction) Reg :

All electrical wiring in a worksite shall :

a) be supported on proper insulators; and

b) not be looped over nails or brackets.

Hang cables on proper insulator, not left on wet ground

WSH (Construction) Reg :

No electrical wiring or cable shall be left or laid on the ground or the floor of a worksite unless it is :

a) of the weather-proof type;

b) provided with adequate protection to withstand the wear and tear to which it may be subjected; and

c) maintained in good and safe working order

Machinery left energized and live cables left lying on ground

WSH (Construction) Reg :

It shall be the duty of the occupier of the worksite where any electrical installation is used in the worksite to ensure that :

a) effective residual current circuit breakers are installed for all temporary electrical installations to provide earth leakage protection; and

b) overcurrent protective devices with the appropriate ratings are installed in the distribution board to provide overcurrent or short-circuit protection.

Distribution board with Residual Current Circuit Breaker (RCCB) and other safety devices

CP 88: Part 1: 2001 :

All cables are to be installed without obstructing the passageways, walkways, ladders, stairs, etc.

Proper cable management

CP 88: Part 1: 2001 :

All temporary electrical installations shall be inspected by a Licensed Electrical Worker (LEW) at least once a month.

Where several voltages are used in the temporary installation, all plugs, sockets outlets and cable couplers shall be identified by different colours:

Operating Voltage (V)	Colour	Examples
55	White	
110	Yellow	
230	Blue	
400	Red	

CP 88: Part 1: 2001 :

Warning signage displayed at distribution board shall have the word 'DANGER' and the operating voltage of the equipment :

a) in block letters of at least 30mm high and 5mm wide;

b) in 4 official languages;

c) in black against a yellow background; and

d) maintained in a clear and legible condition at all times.

Recommended dimensions : 280mm X 400mm

CP 88: Part 1: 2001 :

All plugs, socket-outlets and cable couplers likely to be exposed to the weather shall be contained in waterproof enclosures unless they are of the weatherproof type.

DB box with warning signage and protected from weather

LTA Specification :

A current photograph of the LEW(s) and the contact number(s) shall be displayed on the outside of all boxes containing DBs for ease of reference. These boxes must be secured with locks to prevent tampering and the keys kept with the LEW / Contractor's Safety Department.

Display of photo of LEW and contact number

LTA Specification :

The Contractor shall ensure that all portable electrical appliances used above and below ground level including hand held tools and inspection lamps, are rated at 110 volts AC via a step down transformer Centre Tapped to Earth (CTE)

Only 110 Volts Hand held tools are allowed to be used on site.


EXCAVATION

WSH (Construction) Reg :

Where the depth of any excavation exceeds 1.5 metres or where the banks are undercut, adequate shoring by underpinning, sheet piling, bracing or other means of shoring shall be provided to prevent collapse of the excavation, or any structure adjoining or over areas to be excavated.

No shoring for excavation exceeding 1.5m

WSH (Construction) Reg :

Where the depth of any excavation in a worksite exceed 4 metres, adequate shoring by underpinning, sheet piling, bracing or other means of shoring shall be made or erected in accordance with the design of a professional engineer to prevent collapse of the excavation, or any other structures adjoining or over areas to be excavated.

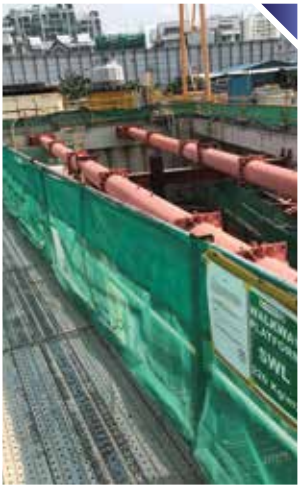
Proper shoring provided for excavation exceeding 4 metres

WSH (Construction) Reg :

The open side of any excavation in a worksite which exceeds 2 metres in depth shall be provided with adequate guardrails to prevent persons from falling into the excavation.

Notices shall be put up at appropriate and conspicuous positions to warn persons about the excavation in a worksite.

Notices and guardrails provided at excavation zone



Proper guardrails provided

WSH (Construction) Reg :

Excavated material or other superimposed loads shall be placed away from the edge of the excavation in a worksite to prevent the materials or other loads from falling into the excavation, or cause the banks to slip or cause the upheaval of the excavation bed.

Equipment and loose materials placed near edge of excavation

WSH (Construction) Reg :

All reasonably practicable measures shall be taken during any excavation work in a worksite to prevent any person from :

a) being trapped by the collapse of the excavation;

b) being struck by an object, such as an excavating machine or by any material dislodged by the machine;

c) falling into the excavation; and

d) inhaling, or otherwise being exposed to, carbon monoxide or other impurity of the air in the excavation.

Working area of excavator was barricaded

WSH (Construction) Reg :

It shall be the duty of the occupier of worksite where any excavation work is carried out to ensure that :

a) safe access to and egress from the excavation in the worksite is provided where persons are required to work in the excavation; and

b) the access and egress is sufficient in numbers and installed in such locations so as to be readily accessible.

Provision of well maintained walkway and access into excavation

LTA Specification :

Proper walkways shall be provided along struts and walers for access and egress. Walkways shall also be provided on planned emergency escape routes.

Proper walkways provided along struts

Walkways were provided to ease evacuation in case of emergencies

LTA Specification :

Designated walkways along walers and struts shall be levelled, flushed without tripping hazards and with rigid guardrails and toe boards securely provided.

Toe boards and netting are added to prevent loose material from falling into excavation

LTA Specification :

Contractor shall design, supply and install proprietary modular tower access with step ladders for access and egress for all work areas including for all excavation works.

Modular tower access provided for access and egress

LTA Specification :

Excavators within the excavation pit shall have suitably reinforced cabin roofs capable of withstanding impact from falling objects from the top of the excavation and its movement coordinated by one of its operator, who shall be appointed as a leader by the Contractor.

Excavator with reinforced roof

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FIRE SAFETY

WSH (General Provisions) Reg :

Means of extinguishing fire shall be provided and maintained and shall be readily accessible, adequate, suitable and tested by a competent person at regular intervals.

Provision of fire extinguishers

Fire extinguisher was not maintained

WSH (General Provisions) Reg :

There shall be effective warning devices that :

a) are capable of being operated without exposing any person to undue risk;

b) are maintained and tested at least once every month;

c) give warning in case of fire; and

d) are clearly audible throughout the factory.

Electrical Fire Alarm

Fire Safety Notice Board and Electrical Fire Alarm provided on site

Manual Alarm provided on site

WSH (General Provisions) Reg :

Effective steps shall be taken to ensure that all the persons at work are familiar with the means of escape and the route to be followed in case of fire.

Display of Emergency Escape Route

SS 510: 2017

All gas cylinders shall be kept away from radiators and other sources of heat. In the case of acetylene and LPG cylinders, they should not be stored within 1.5m of an electrical equipment, unless the electrical equipment is of an explosion-proof type.

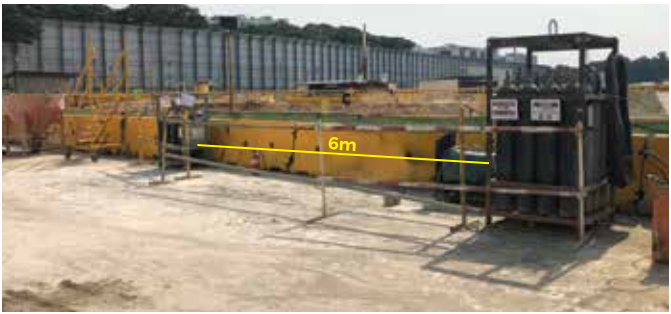
Cylinder Valves shall be protected from damage by protection caps, valve guards or other effective means. Storage temperature of the cylinder contents shall not be allowed to exceed 50 degrees Celsius.

Gas cylinders placed near to heat source

Gas cylinders with trolley

SS 510: 2017

Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials (especially oil or grease), for a minimum distance of 6.0 m or by a non-combustible barrier of at least 1.5m high having a fire-resistance rating of at least ½ hour.



Separation of oxygen and acetylene cylinders by a minimum distance of 6.0m

SS 510: 2017

No welding, cutting, or other hot work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids or other materials which, when subjected to heat might produce flammable or toxic vapours.

SS 510: 2017

All equipment used (for welding, cutting and other operations involving the use of heat) should be visually examined at the beginning of the day, before being used. All hoses must be checked to ensure they are free from cuts, cracks and other defects. Defective hoses and apparatus must not be used. The gas supply must be shut off at the regulators before any changing of torches, hoses or other parts is done.

Before starting the burning operations, checks must be made to ensure that there is no flammable or combustible material nearby.

Defective hose should not be used

Welding area was kept free from flammable materials. Fire extinguisher was provided nearby in case of fire

No proper PPE for welding work

LTA Specification :

In-house emergency exercises and drills shall be conducted on a quarterly basis, table-top exercise with SCDF and all relevant agencies on a half-yearly basis while drills on a yearly basis.

Joint Emergency Evacuation Drill with SCDF


FIRST
AID

WSH (First Aid) (Amendment) Reg :

Where more than 25 persons are employed in a workplace, there shall be a person appointed in the workplace as first-aiders who shall be readily available during working hours and such number of first aider shall complies with the ratio of one first-aider for every 100 persons employed in the workplace or part thereof.

First-aiders were appointed and displayed on prominent areas

LTA Specification :

Qualified first aiders shall be suitably identified with a green cross logo on their safety helmets.

LTA Specification :

An approved first aid station shall be provided and maintained at all times. The station shall be fully equipped to treat illness and injuries which can normally be expected to occur in work of the types required by this Contract. Medical supplies shall be stocked in the types and quantities recommended by the designated doctor.

Provision of proper First Aid Room

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HAZARDOUS SUBSTANCES

WSH (General Provisions) Reg :

Adequate warning notices in languages understood by all persons at work in a factory specifying the nature of the danger of the hazardous substances shall be placed :

a) at all entrances to any workroom; and

b) at appropriate locations,

where the hazardous substances are used or present.

Sources: *https://www.wshc.sg/ghs*

WSH (General Provisions) Reg :

It shall be the duty of the occupier of a workplace in which there is any container of hazardous substances to ensure that, so far as is reasonably practicable, every such container is affixed with one or more warning labels that conform with :

a) any Singapore Standard relating to the classification and labelling of hazardous substances; or

b) such other standards, codes of practice or guidance relating to the classification and labelling of hazardous substances as is issued or approved by the Council.

Chemicals and paints haphazardly stored

CP 79: 1999 :

The occupier shall establish a control program which shall include :

a) maintenance of a register of hazardous materials compiled from Safety Data Sheets (SDS);

b) appointment of a competent person to receive such materials and ensure its safe storage and use;

c) establishment of procedures for labelling, issue, distribution and use;

d) communication of the hazards by the competent person to the users;

e) designation of storage areas secured against unauthorised access; and

f) procedures for disposal.

Proper chemical storage area with warning signs, hazard classification, safe work practices and PPE needed prominently displayed

LTA Specification :

The Contractor shall assess the Safety Data Sheets (SDS) of all the hazardous substances and chemicals for its suitability in terms of SHE hazards and consider safer alternatives prior to its entry to site.

Safety data sheets displayed on notice board

LTA Specification :

The Contractor shall ensure that all hazardous substance or chemical containers are labelled, its movement is recorded and returned to the designated storage areas when not in use.

The contractor may store petrol up to a maximum volume of 5 litres on Site provided that it is kept in a suitably constructed store which is licensed by the Fire Safety & Shelter Department.

Chemical containers properly labelled

HOUSEKEEPING

Construction waste bin placed close to edge of excavation area

WSH (Construction) Reg :

It shall be the duty of the employer of any person who carries out the work of storing, stacking or placing materials or equipment in a worksite to ensure that the material or equipment is not stored, stacked or placed so close to any opening or edge of a floor, scaffold, platform or structure as to endanger persons below the opening or edge.

Construction material stored in orderly manner

Scattered construction materials

Improper storing and stacking of unused materials

WSH (Construction) Reg :

Any sharp projection which is present in any passageway, stair, platform and other means of access or place of work in the worksite and which may injure any person is removed or otherwise made safe.

LTA Specification :

The Contractor shall provide capping on all protruding starter reinforcement bars with individual plastic/rubber caps or with hose/ tube.

Protruding rebar on site

Protruding objects were capped

LTA Specification :

The Contractor shall implement a 5S housekeeping method approved by the Engineer. The method shall be based on a Japanese quality management concept based on cyclical methodology. The 5S shall consist of Sort (Seiri), Set In Order (Seiton), Shine (Seiso), Standardize (Seiketsu) and Sustain (Shitsuke).

Definition of 5S

- **Seiri (Sort/ Organise)**
  Focus on sorting out unnecessary items and disposing them away from the site.

- **Seiton (Set in Place/ Orderliness)**
  Arrange the necessary items in a neat, proper manner for easy retrieval and to return them to their original locations.

- **Seiso (Sweep/ Shine/ Cleanliness)**
  Thoroughly clean and inspect the site.

- **Seiketsu (Standardise)**
  Maintain a high standard of housekeeping at site by keeping everything clean and orderly at all times.

- **Shitsuke (Sustain/ Discipline)**
  Train people to follow good housekeeping standards, and to inculcate self-discipline through continuous practice.

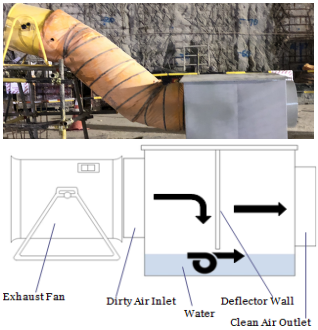
Thus, by adopting the 5S model, a site with good housekeeping and maintenance will be ensured.

Materials were segregated and stored neatly

Workers sweeping floor to keep the walkway clean

Materials were segregated and stored in an organised and orderly manner

Using Dust Eater to prevent dust accumulation on site



Dust control by engineering means

Using vacuum machine with water spray to prevent dust accumulation on site

Automatic water sprinkler system to wet vehicular access

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LADDERS

LTA Specification :

The Contractor shall use step platforms instead of portable ladders for works at height subjected to the Engineer's approval and establish a Permit-To-Work system for such works. In addition, for works in excess of three (3) metres, the Contractor shall demonstrate the stability of these step platforms to prevent toppling.

Step platforms or platform ladders complying with EN131

LTA Specification :

No vertical access ladders exceeding 3 metres in length is allowed on site.

Landing was provided but at an interval exceeding 3 metres

LTA Specification :

Contractor shall ensure that all staircases have antislip strips / paint to prevent slip and fall.

Weekly inspections to be carried out to check and replace all worn out anti-slip strips / paint and damaged steps.


SAFE
ACCESS

LTA Specification :

Contractor has to provide a designated safe access route to and from the Site access control point for this purpose.

Designated walkway provided

LTA Specification :

The Contractor shall provide LED lights along the Emergency Escape stairways and routes for ease of emergency evacuations.

Provision of LED light at escape access

Direction signs provided in station

Continuous walkway with guardrail provided along the tunnel

LIFTING OPERATIONS

WSH (General Provisions) Reg :

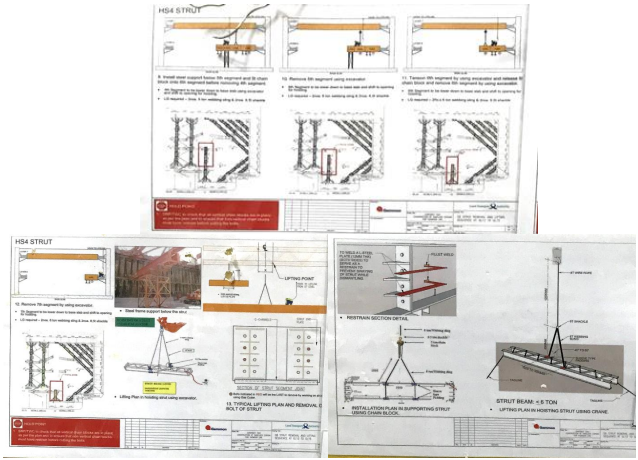
Every lifting appliance and lifting machine shall be thoroughly examined by an authorised examiner at least once every year or such other intervals as the Commissioner may determine.

LM certificate displayed on crane

WSH (Operation of Cranes) Reg :

Where any lifting operation involving the use of any crane is carried out in a workplace by a crane operator, it shall be the duty of the responsible person to establish and implement a lifting plan which shall be in accordance with the generally accepted principles of safe and sound practice.

It shall be the duty of the responsible person to ensure that the lifting plan is made available for inspection upon request by an inspector.



Specific pictorial lifting plan with rigging methods in place

WSH (Operation of Cranes) Reg :

It shall be the duty of the crane operator to ensure that any outrigger when it is required is fully extended and secured.

Outrigger is not fully extended on one side

WSH (Construction) Reg :

It shall be the duty of the operator of a crane or material handling machinery being used in a worksite to ensure that the crane or machinery, as the case may be, is positioned and operated as to be stable.

Wooden planks are not suitable to serve as outrigger platform because they do not provide a firm footing to the crane during lifting

WSH (General Provisions) Reg :

Every lifting appliances and lifting machine in the case of a jib crane so constructed that the safe working load may varied by the raising or lowering of the jib, shall have an accurate indicator, which must be placed so as to be clearly visible to the driver of the jib crane, that shows the radius of the jib at any time and the safe working load corresponding to that radius.

Indicator showing the boom length, boom angle, radius, weight of load and safe working load

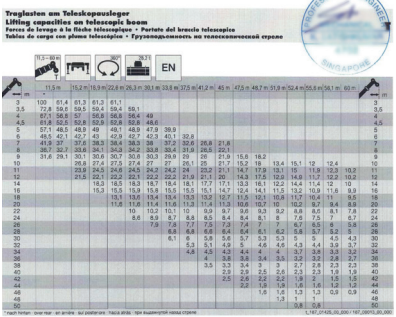
WSH (Construction) Reg :

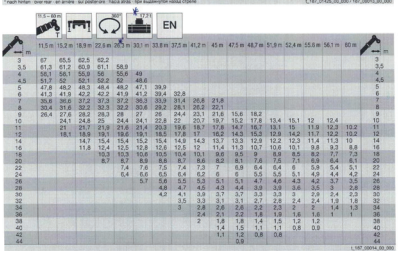
The capacity chart shall :

a) be posted and maintained in the crane which is clearly visible to the operator;

b) set out the safe loads for various lengths of jib at various angles and radial distances; and

c) be prepared and certified by an authorised examiner, unless it is furnished by the manufacturer or builder of the crane.





Capacity chart displayed in language comprehensible to the crane operator and lifting supervisor

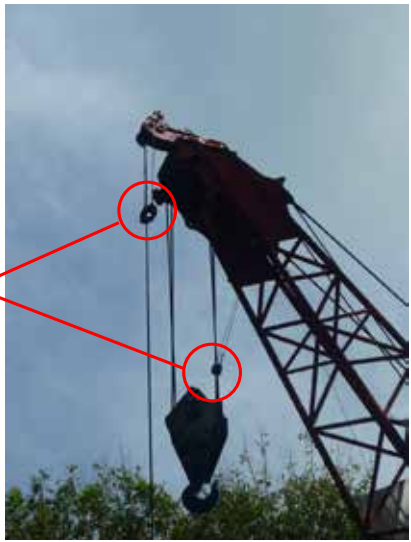
WSH (Construction) Reg :

Ensure that loads that have a tendency to swing or turn freely during hoisting are controlled by tag-lines.

Tagline tied to the load for better control during lifting

SS 536:2008 :

Hook block shall not be allowed to hit the boom tip. Operator shall exercise care when hoisting up or telescoping out of the boom to provide sufficient length of wire rope. Two-block damage-preventing devices shall be fitted.



Sensing devices to Over-Hoisting Limit Switch

SS 536: 2008 :

Load hooks shall be provided with a swivel and safety latch.

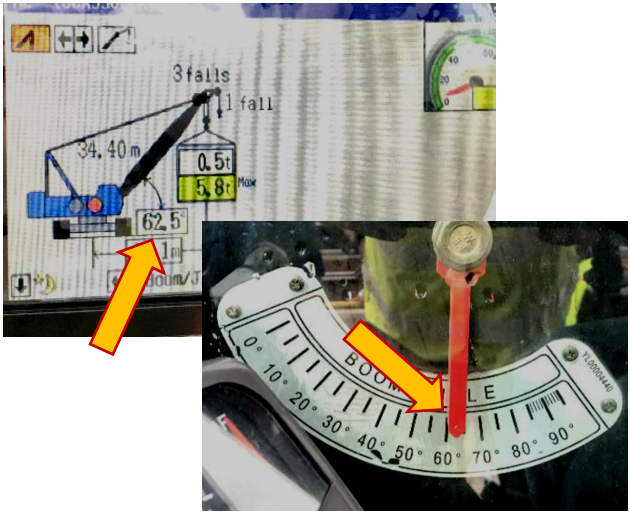
The rated capacity of the lifting hooks shall be clearly and permanently marked on them.

The dead weight of the hooks shall also be clearly marked.

Load hooks with swivel and safety latch

SS 536:2008 :

For cranes with derricking jibs, the maximum boom angle shall be 80° to the horizontal except for tower arrangements and automatic means shall be provided to stop the boom hoisting operation from exceeding the maximum allowable angle.



External boom angle indicator coincide with the angle displayed on screen.

CP 536:2008 :

Use of more than one crane shall be carefully planned out by a competent person in detail with emergency plans. Key points to note :

a) lifting operations shall be carried out under proper supervision;

b) supervisor and operators fully understand the operation;

c) cranes used to be of similar characteristics, eg. hoisting, derricking, slewing, travel speeds;

d) each crane to have at least 25% excess capacity than the maximum share of the load;

e) lifting gears are of adequate size and capacity for the operation;

f) hoist line of cranes shall always be vertical; and

g) crane shall not be used to perform a duty which is not a normal crane operation.

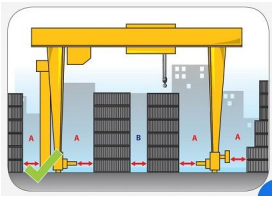
Lifting using 2 cranes under proper supervision

SS 497:2011:

Clause 15.3.1 requires unobstructed passageway of at least 750mm in width on each side of each rail.

LTA Specification :

An unobstructed passageway of at least 750mm in width on each side of each rail, shall be maintained parallel to and extending the entire length of the tracks upon which any gantry crane is operated.



Ensure adequate clearances between cranes and fixed objects.

A ≥ 750mm

B ≥ 600mm

Clearance of 750mm not maintained

LTA Specification :

Steel plates of minimum dimensions 1m X 1m X 25mm shall be placed under all the outriggers of any lorry mounted mobile crane deployed for a lifting operation unless the crane is entirely sited on hard standing such as a reinforced concrete surface, with no void underneath.

Correct placement of steel plates for outriggers (outriggers fully extended)

Steel plates were lined along the crane access to ensure crane stability in preparation for lifting operation

Uneven steel plates can cause tripping and worker's foot can get caught in between when machinery/ vehicles goes across.

Lifting area demarcated with warning signage

Crane operation area are demarcated by safety cones with gaps which can still allow workers to pass through.

Interlocking device for outriggers

LTA Specification :

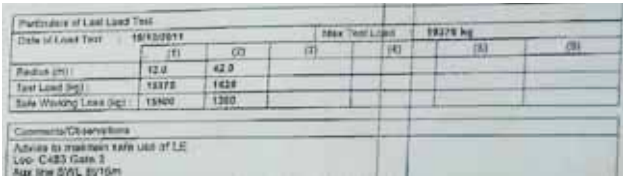
Cranes fitted with a load radius indicator (LRI) shall sound an audible alarm in the crane cab if its safe working load is exceeded on either the main or auxiliary hook. A second alarm connected to the LRI, shall be fitted external to the cab and shall emit a signal of a sufficient volume to make it audible above the ambient site noise levels during working hours. Visual warning shall also be provided externally to indicate safe working range and overload conditions.

Visual warning light installed on crane for night work :
Green (within SWL),
Amber (reaching SWL)
Red (exceeded SWL)

Externally fitted audible alarm

LTA Specification :

The Contractor shall ensure that no lifting operation shall be carried out on site using the auxiliary hook of a mobile crane unless the SWL of this is shown on the LM certificate in addition to that of the main hook block, and is not exceeded.


Particulars of Last Load Test

Date of Load Test: 10/03/2011			Max. Test Load: 99270 kg			
	(1)	(2)	(3)	(4)	(5)	(6)
Radius (m)	12.0	42.0				
Test Load (kg)	99270	1620				
Safe Working Load (kg)	75600	1300				

Comments/Observations

Advise to maintain safe use of LE
Loc: C483 Gate 2
Aux line SWL 8t/16m

The SWL of the auxiliary hook and the main hook is shown on the LM certificate

Crane information, including SWL of auxiliary line prominently displayed on crane

LTA Specification :

No excavator shall be used as a lifting machine on site unless it is originally designed and manufactured to also function as a lifting machine and complies with all MOM stipulated requirements.

List of MOM requirements for excavator to perform lifting functions :

a) the excavator has been originally designed and manufactured to also function as a lifting machine;

b) the excavator shall be equipped with original hook(s) with safety catch for hoisting purposes;

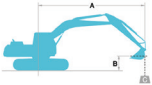
c) the excavator shall have a load capacity chart furnished by the manufacturer or builder;

d) the excavator shall be equipped with an accurate indicator which shows clearly to the operator, the working radius and the corresponding safe working load at all times and gives a warning signal when the radius is unsafe; and

e) any other applicable requirements as stipulated in the WSH Act and its subsidiary legislations.

Indicator with working radius and corresponding SWL

Lifting Capacities



Rating over front

Rating over side or 360 degrees

A - Reach from swing centerline to bucket hook
B - Bucket hook height above/below ground
C - Lifting capacities in kilograms
• Max. discharge pressure: 37.8 MPa (385 kgf/cm²)

SK200 — Standard Arm: 2.94 m Bucket: 0.8 m³ ISO heaped 640 kg Shoe: 600 mm

A / B		1.5 m		3.0 m		4.5 m		6.0 m		7.5 m		At Max. Reach		Radius
7.5 m	kg											*2,860	*2,860	6.33 m
6.0 m	kg							*4,610	4,540			*2,710	*2,710	7.42 m
4.5 m	kg							*5,130	4,350	*4,520	2,930	*2,720	2,530	8.09 m
3.0 m	kg			*12,070	*12,070	*7,620	6,420	*5,930	4,070	4,450	2,800	*2,850	2,260	8.44 m
1.5 m	kg			*6,670	*6,670	*9,260	5,850	6,140	3,800	4,300	2,670	*3,140	2,150	8.51 m
G. L.	kg			*7,690	*7,690	9,410	5,520	5,910	3,600	4,180	2,560	3,570	2,170	8.30 m
-1.5 m	kg	*6,890	*6,890	*10,910	10,520	9,270	5,400	5,810	3,510	4,130	2,510	3,890	2,370	7.81 m
-3.0 m	kg	*10,460	*10,460	*13,520	10,690	9,320	5,440	5,820	3,520			4,660	2,850	6.96 m
-4.5 m	kg			*10,440	*10,440	*7,450	5,630					*5,670	4,080	5.59 m

SK200 — Standard Arm: 2.94 m Bucket: 0.8 m³ ISO heaped 640 kg Shoe: 800 mm

A / B		1.5 m		3.0 m		4.5 m		6.0 m		7.5 m		At Max. Reach		Radius
7.5 m	kg											*2,860	*2,860	6.33 m
6.0 m	kg							*4,610	*4,610			*2,710	*2,710	7.42 m
4.5 m	kg							*5,130	4,470	*4,520	3,030	*2,720	2,620	8.09 m
3.0 m	kg			*12,070	*12,070	*7,620	6,600	*5,930	4,200	4,600	2,900	*2,850	2,340	8.44 m
1.5 m	kg			*6,670	*6,670	*9,260	6,040	6,350	3,930	4,450	2,760	*3,140	2,230	8.51 m
G. L.	kg			*7,690	*7,690	9,730	5,700	6,120	3,730	4,340	2,650	*3,630	2,260	8.30 m
-1.5 m	kg	*6,890	*6,890	*10,910	10,850	9,590	5,580	6,020	3,630	4,290	2,610	4,040	2,460	7.81 m
-3.0 m	kg	*10,460	*10,460	*13,520	11,020	*9,410	5,620	6,030	3,650			4,830	2,950	6.96 m
-4.5 m	kg			*10,440	*10,440	*7,450	5,820					*5,670	4,220	5.59 m

SK200 — Short Arm: 2.4 m Bucket: 0.93 m³ ISO heaped 710 kg Shoe: 600 mm

A / B		1.5 m		3.0 m		4.5 m		6.0 m		7.5 m		At Max. Reach		Radius
7.5 m	kg											*4,190	*4,190	5.66 m
6.0 m	kg							*5,050	4,390			*3,950	3,420	6.86 m
4.5 m	kg					*6,550	*6,550	*5,510	4,210	*4,420	2,830	*3,990	2,770	7.58 m
3.0 m	kg					*8,220	6,180	*6,250	3,950	4,360	2,720	3,940	2,440	7.95 m
1.5 m	kg					9,590	5,860	6,020	3,700	4,230	2,600	3,790	2,320	8.02 m
G. L.	kg			*6,870	*6,870	9,280	5,410	5,830	3,530	4,140	2,510	3,890	2,360	7.81 m
-1.5 m	kg	*7,710	*7,710	*11,810	10,530	9,220	5,350	5,770	3,470			4,310	2,610	7.28 m
-3.0 m	kg	*12,470	*12,470	*12,240	10,750	*8,820	5,450	5,850	3,540			5,360	3,260	6.36 m
-4.5 m	kg			*8,600	*8,600	*6,210	5,730					*5,690	5,190	4.81 m

SK200 — Long Arm: 3.5 m Bucket: 0.7 m³ ISO heaped 630 kg Shoe: 600 mm

A / B		1.5 m		3.0 m		4.5 m		6.0 m		7.5 m		At Max. Reach		Radius
7.5 m	kg											*2,460	*2,460	6.89 m
6.0 m	kg									*3,200	3,000	*2,350	*2,350	7.90 m
4.5 m	kg							*4,530	4,360	*4,240	2,910	*2,370	2,240	8.53 m
3.0 m	kg			*10,000	*10,000	*6,720	6,510	*5,360	4,060	4,410	2,750	*2,490	1,990	8.86 m
1.5 m	kg			*10,400	*10,400	*8,520	5,860	6,090	3,750	4,230	2,590	*2,740	1,880	8.92 m
G. L.	kg	*3,630	*3,630	*8,600	*8,600	9,310	5,420	5,820	3,500	4,080	2,450	*3,170	1,800	8.73 m
-1.5 m	kg	*6,370	*6,370	*10,620	10,170	9,080	5,220	5,660	3,360	3,990	2,370	3,440	2,030	8.26 m
-3.0 m	kg	*9,310	*9,310	*14,170	10,270	9,060	5,200	5,630	3,330			4,030	2,400	7.47 m
-4.5 m	kg	*12,890	*12,890	*11,730	10,580	*8,160	5,340	5,760	3,450			5,460	3,280	6.21 m
-6.0 m	kg											*5,350	*5,350	4.08 m

Load capacity chart of the excavator

LTA Specification :

All cranes without manufacturer fitted data loggers operating on LTA sites shall be retrofitted with data loggers approved by the Engineer.

The data recorded by the data loggers shall be monitored, downloaded and interpreted by the Contractor on a monthly basis and submitted to the Engineer in the form of a report. The Engineer may at his discretion require the Contractor to download the data when he deems necessary.

Crane Data loggers (Black Box)

LTA Specification :

The contractor shall ensure that every LG/LA brought onto site, including those accompanying rental cranes, lorry loaders, excavators, cement buckets, air receivers, skips, welding sets etc. has a valid LG/LA certificate and is clearly marked with its SWL. All LG/LA shall be inspected by an Authorised Examiner once every six months.

Expired LG should be promptly removed from site

LTA Specification :

When not in used, the Contractor shall ensure that all items of the LG/LA are stored in a rack sheltered from the weather and maintained regularly. Should any LG/LA be exposed to a corrosive material e.g. wet concrete, it must be washed and re-greased.

Lifting gears properly stored and maintained in good condition

LTA Specification :

The Contractor shall implement an inspection programme to thoroughly check all LG/LA by a lifting supervisor prior to its first use and thereafter on a monthly basis. A monthly colour coding system shall be adopted. Defective LG/LA shall be discarded.

Colour coding system

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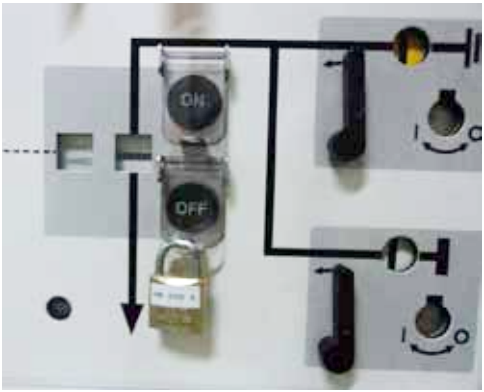
LOCKOUT PROCEDURE

WSH (General Provisions) Reg :

It shall be the duty of the occupier of a factory to establish and implement lock-out procedures relating to the inspection, cleaning, repair or maintenance of any plant, machinery, equipment or electrical installation in the factory that, if inadvertently activated or energised, is liable to cause bodily injury to any person.

SS 571: 2011 :

Locks should be provided by the responsible person/occupier and should be the only authorised device(s) used for the lockout of energy sources. They should be singularly identified and specifically approved for lockout.



Placement of a lockout device on an energy isolating device

MACHINERY GUARDING

SS537: Part1: 2008 :

The fixed guard should be provided to prevent access to the hazardous parts of the machinery. It should be of robust construction, sufficient to withstand the stresses of the process and environmental conditions.

Fixed guard installed to prevent worker from coming into contact with the machine's hazardous moving part

Fixed guard installed to prevent worker from coming into contact with the machine's hazardous moving part

Steel wire should not be used in place of whiplash arrestor

Use of proper whiplash arrestor

SCAFFOLDING

WSH (Scaffolds) Reg :

Every scaffold in a workplace shall be constructed, erected or installed on structures or foundations of adequate strength.

In the case of a scaffold in a workplace exceeding 15 metres in height or being erected on poorly drained soil, base plates shall bear upon sole plates that are :

a) of strength not less than 670 kgf per square metre; and

b) of a length suitable to distribute the load.

There shall be no cavity under the sole plate immediately below any standard of a scaffold in a workplace.

Substandard timber pieces used as foundation is not acceptable

Poor foundation of inadequate strength

WSH (Scaffolds) Reg :

Ensure that stairs or ladders are provided to enable persons to gain access from one level of any scaffold in a workplace to another level and so far as is reasonably practicable, are installed within the scaffold.

Proper stairs were provided for access from one level of the scaffold to another level

WSH (Scaffolds) Reg :

Work platforms in a workplace shall be provided :

a) at any place of work which does not afford a proper and secure foothold; and

b) in the case of a building under construction, around the edge of the building at every uppermost permanent floor which is under construction.

WSH (Scaffolds) Reg :

Every side of a work platform or workplace from which a person is liable to fall more than 2 metres shall be provided with toe-boards and 2 or more guards-rails.

Provided proper working platform, access, toe-boards and edge protection

WSH (Scaffolds) Reg :

Signboards stating the maximum permissible weight of tools and materials and the maximum number of persons permissible on each bay shall be prominently displayed at suitable locations on the scaffold in a workplace.

Safe Working Load prominently displayed

WSH (Scaffolds) Reg :

Any board or plank which forms part of a work platform shall project beyond its end support to a distance of not less than 50 millimetres and not more than 4 times the thickness of the board or plank unless it is effectively secured to prevent tipping or uplift.

Working platform protruded more than 4 times the thickness of the board

WSH (Scaffolds) Reg :

All board, planks or decking used in the construction of work platform shall :

a) be of uniform thickness;

b) be capable of supporting a load of 670kgf per square metre with due regard to the spacing of the supports; and

c) be flushed along their lengths and secured.

working platform not flushed along their lengths and secured

WSH (Scaffolds) Reg :

Ensure that no scaffold is used unless it has been inspected by a scaffold supervisor :

a) upon completion of its construction, erection or installation, as the case may be;

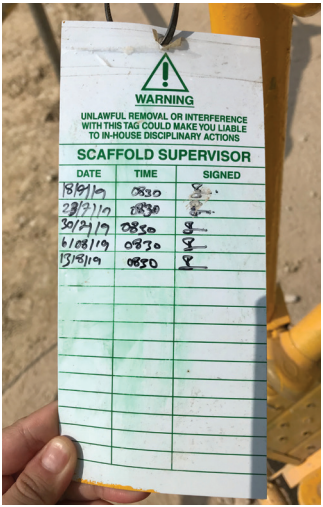
b) thereafter, at intervals of not more than 7 days immediately following the date of the last inspection by the scaffold supervisor; and

c) after exposure to weather conditions likely to have affected strength or stability or to have displaced any part.

Erected scaffold was inspected by scaffold supervisor

WSH (Scaffolds) Reg :

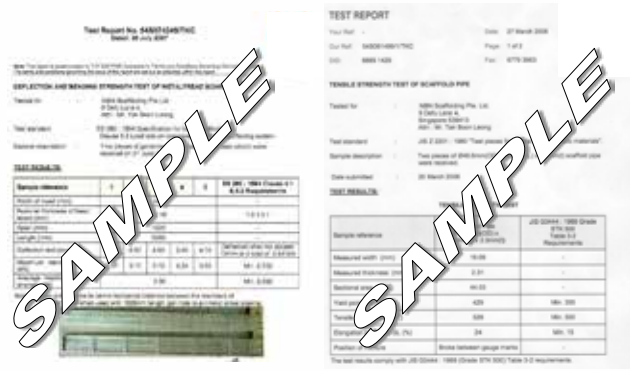
Scaffold supervisor who carries out the inspection of a scaffold under regulation 26 shall immediately after such inspection, display a notice or label indicating whether the scaffold is safe for use or otherwise.



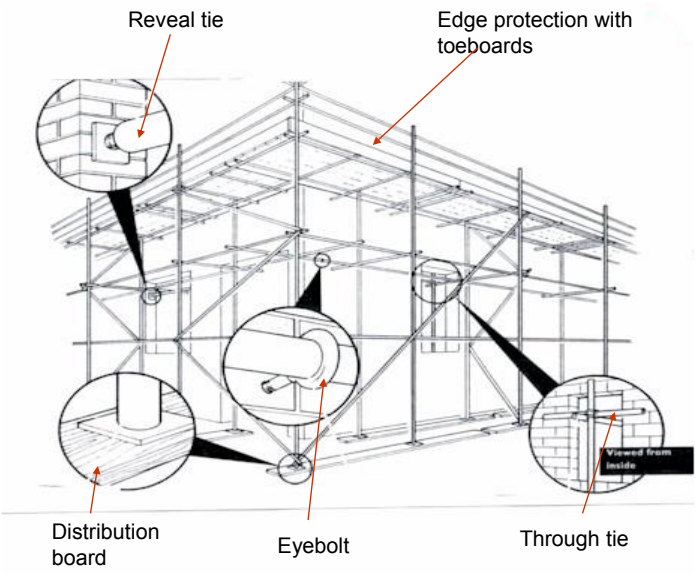
Scaffold inspected and tagged 'Safe to Use'

WSH (Scaffolds) Reg :

No metal scaffold shall be erected or installed in a workplace unless it has been type-tested by a recognised testing body in accordance with a standard or specification acceptable to the Commissioner and complies with such conditions as the Commissioner may think fit to impose.



Scaffold Test Certificate



WSH (Scaffolds) Reg :

Every alternate lift and every uppermost lift of an independent tied metal scaffold in a workplace shall be effectively tied to the building or structure by means of ties.

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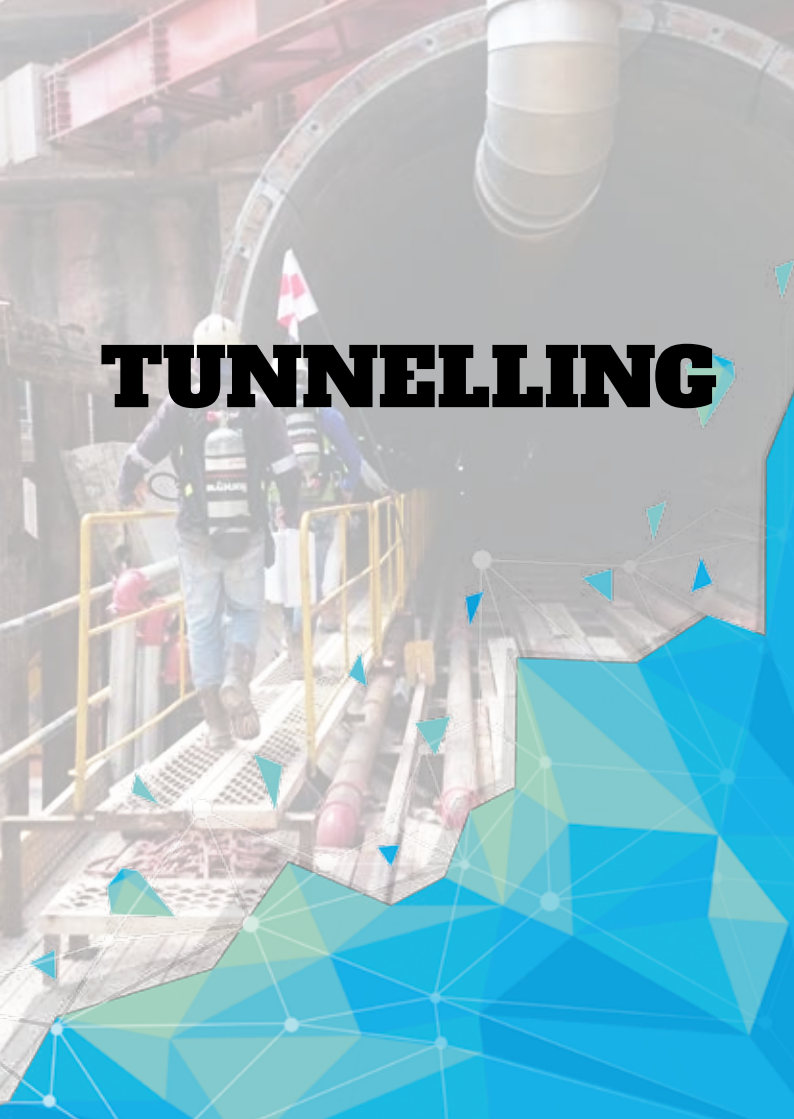


TUNNELLING

WSH (Construction) Reg :

In a worksite where tunnelling works are carried out :

a) all work area in a free air tunnel shall be provided with appropriate ventilation system to ensure adequate supply of air;

b) all reasonably practicable measures shall be taken to ensure that the air in the tunnel where a person has to work is free from flammable gases and vapours and contains :

   (i) at least 19.5% oxygen by volume; and

   (ii) not more than 23.5% oxygen by volume; and

c) air that has passed through any underground oil or fuel storage shall not be used for ventilation in the tunnel.

Gas check

WSH (Construction) Reg :

In a worksite where tunnelling works are carried out :

a) all areas in the tunnel shall be adequately illuminated; and

b) emergency generators are provided to ensure adequate illumination of the tunnels and work areas in the event of a failure in the power supply.

Well illuminated tunnel

Tally board placed near excavation opening

Usage of RFID to record number of person entering the tunnel

WSH (Construction) Reg :

No diesel engine shall be used in a tunnel unless it is so constructed that no air enters the engine without first being cleaned, and no fumes or sparks shall be emitted by the engine :

a) oil, grease or fuel stored in the tunnel shall be kept in tightly sealed containers in fire resistant areas at safe distances from explosives, magazines, electrical installations and away from bottom of shafts;

b) gasoline or liquefied petroleum gases or other flammable substances shall not be used in the tunnel without the approval of the project manager of the worksite.

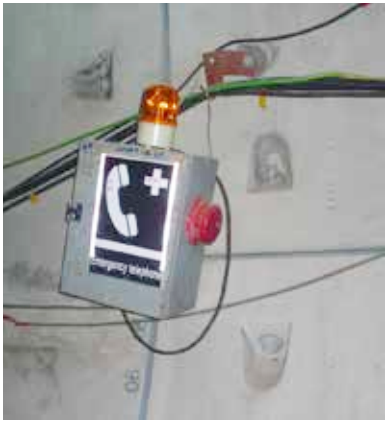
Tunnel kept free of combustible material

Provision of fire point in tunnel

WSH (Construction) Reg :

a) Effective and reliable means of communication, such as telephone network, shall be provided at intervals of 100 metres along the tunnel in the worksite, including outside the portal or at the top of the shaft, and maintained at all times.

b) Any code of audio and visual signals used shall be conspicuously displayed near the entrances to the worksite and such other locations as may be necessary to bring it to the attention of all persons concerned.



Emergency telephone provided in tunnel

WSH (Construction) Reg :

No oxy-acetylene shall be used in the compressed air environment in the worksite.

WSH (Construction) Reg :

Where work in a compressed air environment in a worksite is carried out :

a) no person shall consume alcohol or smoke while at work in the compressed air environment;

b) no person shall carry cigarettes, cigarette lighters, matches or other sources of ignition into the compressed air environment; and

c) no person who has consumed alcohol shall be allowed to undergo compression in any lock in the worksite other than in a medical lock.

'No smoking' sign at entrance into the Medical lock

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WORK AT
HEIGHT

WSH (Work at Height) Definitions :

"Work at height" means work :

(a) in or on elevated workplace from which a person could fall;

(b) in the vicinity of an opening through which a person could fall;

(c) on a surface through which a person could fall; or

(d) in any other place(whether above or below ground) from which a person could fall

Provision of secure foothold and handhold

WSH (General Provisions) Reg :

Where it is not reasonably practicable to provide a secure foothold or handhold, other suitable means such as safety harness or safety belt shall be provided for ensuring the safety of every person working at such places.

Provision of safety harness for workers working at height

WSH (Work at Height) Reg :

It shall be the duty of the responsible person of any person who carries out or is to carry out any work at height to ensure that the person shall work at height in a workplace only after he has first received adequate safety and health training to familiarise himself with the hazards associated with work at height and the precautions to be observed.

The MOM approve Work-at-Height training as listed below:

1. Work-at-Height Course for Workers
2. Managing Work-at-Height Course

Work-at-height training at the Safety Training School

WSH (Work at Height) Reg :

Before carrying out of any hazardous work at height at a factory, it shall be the duty of the occupier of the factory to:

a) Appoint a competent person for the hazardous work at height at the factory to carry out the duties of an authorised manager; and

b) Appoint a competent person for the hazardous work at height at the factory to carry out the duties of a work-at-height safety assessor.

Worker balancing on piping and 3 workers on MEWP working platform

Worker standing on a cable tray

WSH (Work at Height) Reg :

It shall be the duty of the occupier of every workplace specified in the Schedule, and in which work at height is carried out, to establish and implement a fall prevention plan.

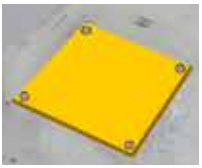
CP for Working Safely at Heights :

A comprehensive fall prevention plan should include (but not be limited to) the following components:

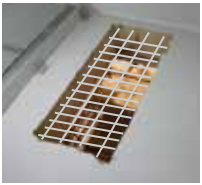
(a) Policy for fall prevention;
(b) Responsibilities;
(c) Risk management;
(d) Risk control measure;
(e) Procedures
(f) Use of personal protection equipment;
(g) Inspection and maintenance;
(h) Training;
(i) Incident investigation; and
(j) Emergency response.

LTA Specification :

The Contractor shall note that the slab openings on site shall comprise of varying sizes and are categorised into three (3) groups.



Group 1: 300mm wide x any length:
A plywood cover (12 or 18mm thick) bolted or nailed down. Cover to be painted in a distinctive colour or pattern.



Group 2: 300mm – 1000mm wide x any length:
A13 mesh, fixed to the top steel and cast into the slab. After casting, a plywood cover can be fitted and secured to prevent debris from falling through.

Group 3: Greater than 1000mm x any length:
Standard method of railings, toeboards and netting shall be provided, with the height of railings to be at least 1.1m high.

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WORKS TRAIN
OPERATION

Use of wheel scotch on stationary trains to prevent runaway train through unintentional movement

Target disc displayed in front and back of train used in conjunction with wheel scotch for stationary train

Point Numbers marked clearly to avoid confusion

Point secured with G Clamp & Point Scotch for a Safe Shunting movement

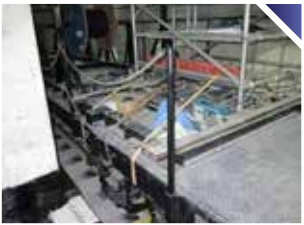
Buffer installed at the end of track to prevent overrun of train

Warning signage posted on Works Train

Ground Shunter using coloured flags to direct an approaching train

Sector Limit Board with flashing light is used by the Possession Master who has full control of a sector for demarcation purposes

Service Vehicle Load Gauge installed to ensure loads or materials on the train will not protrude beyond allowable limits



Materials are secured onto the wagon before moving off to avoid derailment caused by objects on the rails

Demarcation of Defined Areas

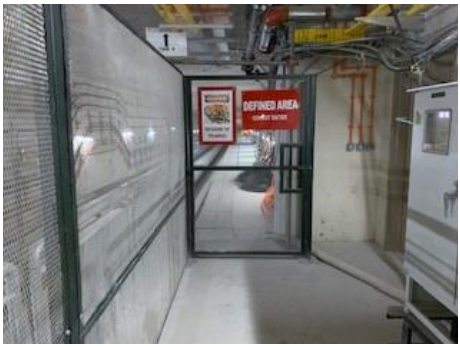
Warning signages posted for Defined Areas

Providing proper access

Brightly coloured Short Circuit Device (SCD) applied onto energised track to prevent electrocution of workers

Un-commissioned signals and indicators are concealed to avoid confusion

Any materials left within the Defined Area must be labelled clearly and approved by WT Office. It must not infringed into structure gauge



Access gate into the Defined Area is secured during Traction power ON to prevent unauthorised access

RESTRICTED USE
OF HAND PHONE

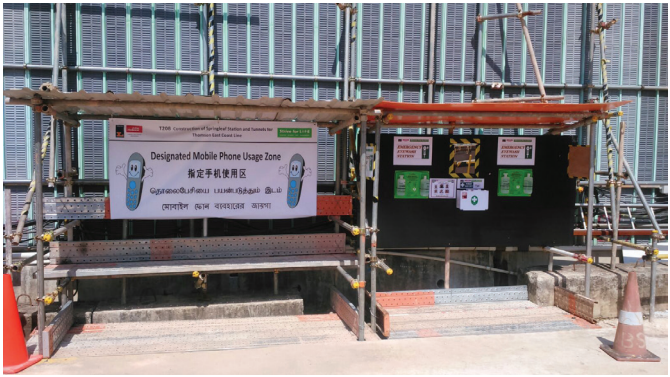
LTA Specification :

All workers / operators are banned from using hand phone / MP3 devices at LTA worksites. The hand phones are to be surrendered to respective supervisors and stored away at rest areas with lockers. Workers / Operators are only allowed to use their hand phones / MP3 during rest times and breaks. Exceptions for specific workers (e.g. Surface watchman for tunneling works) shall be considered on need to-basis and LTA's approval is required.

Warning signages displayed on site to warn workers and operators against the use hand phones.

LTA Specification :

For foreman and above, hand phone usage is allowed only at designated safe zones. The hand phone users needs to adopt safe mode (stop walking and observe surrounding) prior to answering of call.



Designated Hand phone usage safe zones

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PERSONAL PROTECTIVE EQUIPMENT

WSH (Construction) Reg :

It shall be the duty of the employer of any person who carries out any work in a worksite or the principal under whose direction any person carries out any work in a worksite to provide and maintain the appropriate personal protective equipment to the person.

The protection is as follows :

a) eye protection
b) fall protection
c) foot protection
d) hand protection
e) head protection
f) hearing protection; and
g) respiratory protection.

Signage to remind site personnel to put on PPE

LTA Specification :

The contractor shall provide, maintain and enforce the usage of PPE for all the personnel on site at all times. The following PPE shall be compulsory in site :

a) safety helmets with chin strap conforming to SS98 showing the contract number;

b) safety footwear with steel toe cap and steel sole plate conforming to SS513;

c) high-visibility vest/clothing conforming to BS EN ISO 20471;

d) safety belts shall be provided for restraining falls or safety harness for fall protection. Safety belts and harness shall comply with SS528 series (Personal fallarrest systems), SS541 (Restraint belts) and SS570 (Personal protective equipment for protection against falls from a height – Single point anchor devices and flexible horizontal lifeline systems);

e) respirators / dust masks of the appropriate standard shall be provided for activities generating dust or fume.

Head Protection

Safety helmet

Eye Protection – Safety goggles

Safety goggles

Visibility Protection

High-visibility vest

Respiratory Protection

Dust Mask :

It is relatively comfortable but offers minimal protection due to inferior sealing qualities.

Half-face respirators :

Relatively light-weight as well as offer good protection.

Full-face respirators :

Heavier than half-mask and less comfortable but it offers more protection through its better sealing qualities.

It also protects the eyes and face from irritating vapours.

Hearing Protection

Ear Plugs :

Ear plugs provide better noise protection if properly fitted into the ear canal. Generally, NRR (Noise Reduction Rating) for ear plug is higher than NRR for ear muff.

Ear Muffs :

Ear muffs provide lower level of noise protection as compared to ear plugs. However, the wearer is most likely to get the rated protection due to its ease of providing proper fit.

LTA Specification :

The contractor shall assess the work hazards and ensure suitable hand gloves are provided and used. The Contractor shall provide minimum cut-resistance safety gloves in accordance with EN388 and EN420 (with a rating of 5 for both cut resistance and dexterity) for all personnel and workers on site for protection against hand injuries.

Use cut-resistance glove for manual handling work.

Hand Protection

Metal mesh gloves :

Protect hands from accidental cuts and scratches from working with cutting tools.

Latex-coated Kevlar gloves :

Improve grip and protect hands from cut and abrasion.

Leather gloves :

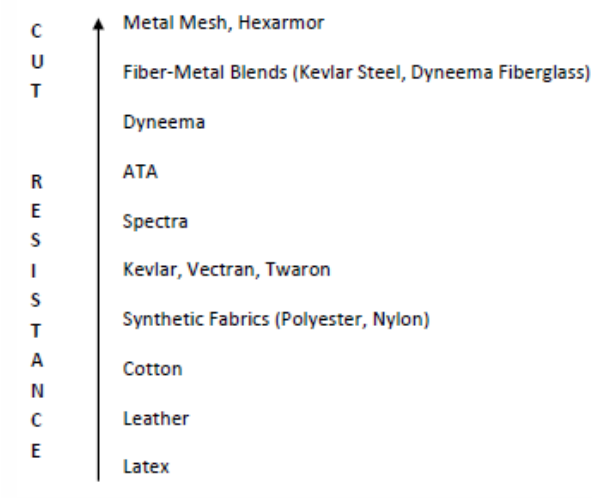
Guard against injuries from sparks or scraping against rough surfaces.

Chemical resistant gloves :

Protect hands from corrosives, oils, and solvents.

Note:
When selecting chemical resistance gloves, be sure to consult the manufacturers' recommendations

Chart of cut resistance level



Sources :
Making Sense of Cut Resistance by National Safety, Inc. (USA)
www.nationalsafetyinc.com

Note :
Please refer to manufacturers' recommendations and the above chart when selecting a pair of cut resistant gloves

Foot Protection

Safety boots

High heeled waterproof safety boots

Fall Protection

Fall Arrest

Safety harness – Stop the fall (keep the wearer from hitting the ground after a fall from the edge).

Fall Restraint

Safety belt – Restraint wearer from falling (keep the wearer away from the edge).

LTA General Specification Appendix A

Workplace Safety and Health Act

WSH (Design for Safety) Regulations

WSH (Confined Space) Regulations

WSH (Construction) Regulations

WSH (First Aid) Regulations

WSH (General Provisions) Regulations

WSH (Operation of Cranes) Regulations

WSH (Scaffolds) Regulations

WSH (Working at Heights) Regulations

SS 510: Code of Practice for safety in welding and cutting (and other operations involving the use of heat)

SS 536: Code of Practice for The Safe Use of Mobile Cranes

SS 537: Part 1: Safe Use of Machinery

SS 568: Code of Practice for Confined Spaces

SS 571: Code of Practice for Energy Lockout and Tagout

CP 79: Code of Practice for Safety Management System for Construction Worksites

CP 88: Part 1: 2001: Code of Practice for Temporary Electrical Installations (Construction and Building Sites)